MACHINERY

Design—Construction—Operation

Volume 42 JULY, 1936 Number 11

PRINCIPAL ARTICLES IN THIS NUMBER

FOR COMPLETE CLASSIFIED CONTENTS, SEE PAGE 760-E

DEPARTMENTS

Riveting now a silent operation! **Impossible things seem to happen all the time in the mechanical field; but who would have believed that riveting could be made silent. Yet this is an accomplished fact. Rivets are now being driven noiselessly—hot or cold—by newly developed portable hydraulic equipment. August MACHINERY will furnish detailed information on the subject.**

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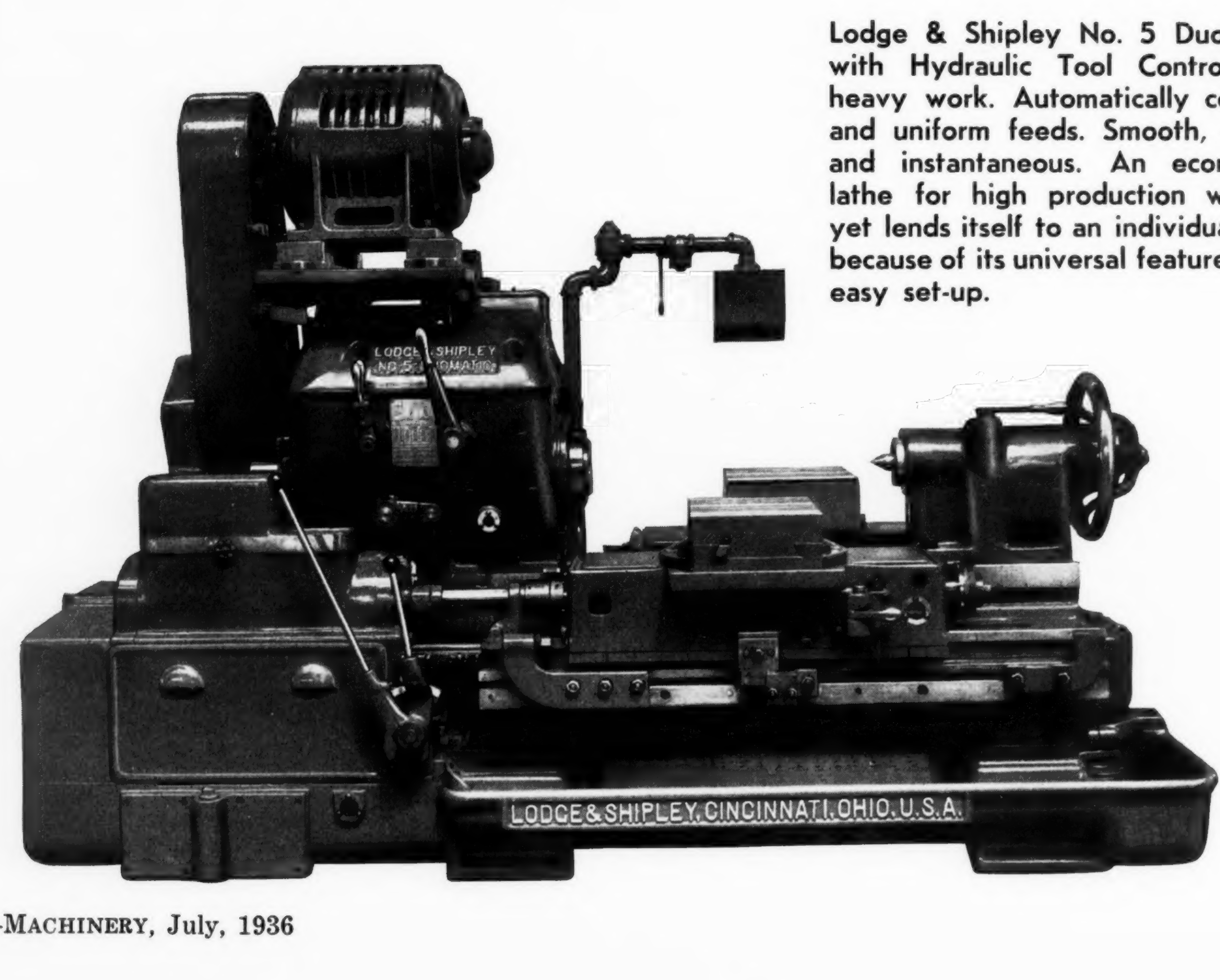

MACHINERY

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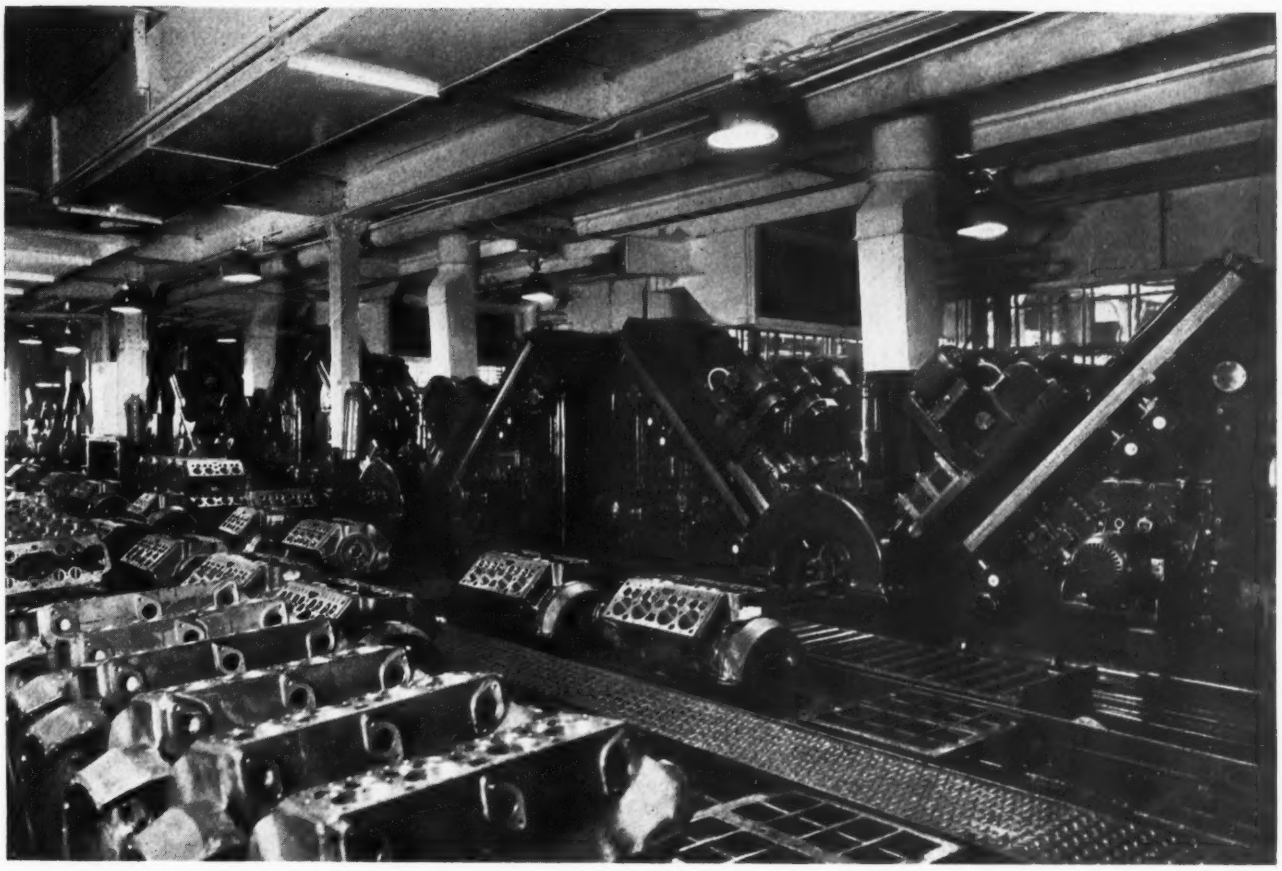


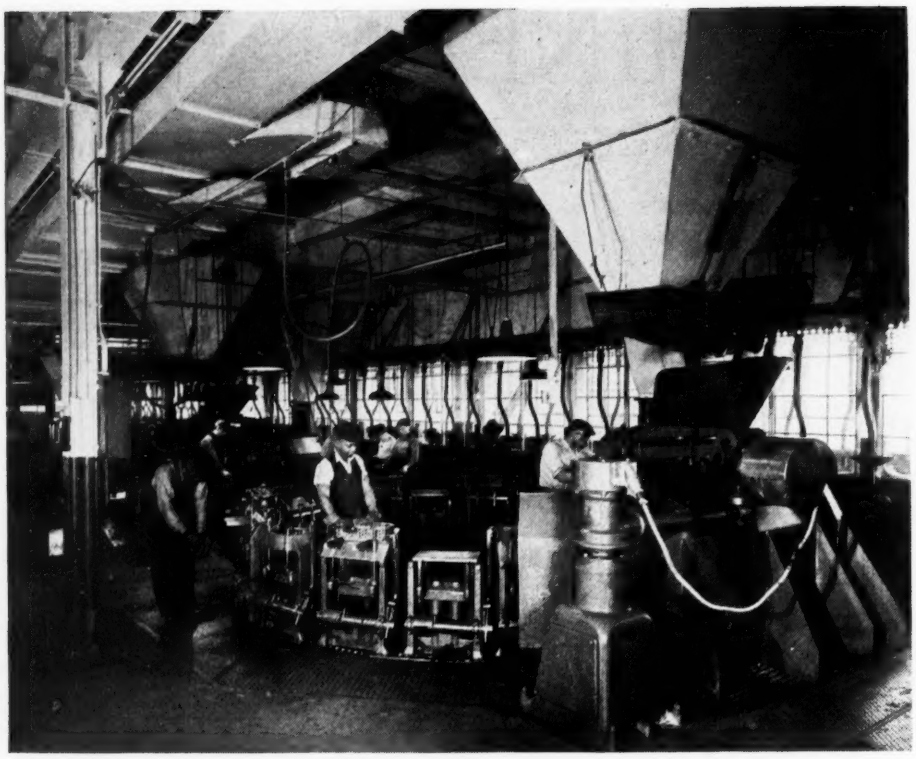
An Air-Conditioned Machine Shop Turns Out More Accurate Work

The Ford Motor Co. Finds that Air-Conditioning in Shop and Foundry Departments Pays in Dollars and Cents

By CHARLES O. HERB

AIR-CONDITIONING has long been applied in factories to provide special atmospheric conditions that may be necessary in the manufacture of a product and to remove obnoxious fumes. But when a machine shop department is air-conditioned to insure more accurate work and comfortable conditions for the men, that is news.

One of the most important requirements in the manufacture of an automobile is to finish the cylinders of the engine block within close limits as to diameter, straightness, and roundness, and to a high degree of smoothness. To attain these objectives, the Ford Motor Co. finish-bores the cylinders on precision boring machines of the two-way opposed type seen in the heading illustration, which employ single-point tungsten-carbide tools.



A Foundry Molding Room where the Men Work in Comfort. In Winter, the Temperature is Always 70 Degrees, and on Hot Summer Days, it is 15 Degrees Cooler than Outdoors

Honing machines of the same general appearance are then used for final finishing.

Twelve of these precision boring machines and six of the honing machines were installed about a year ago in one of the machine shop departments of the Rouge Plant at Dearborn, Mich. When the engine blocks leave these machines, the cylinders must be within plus or minus 0.0005 inch of the specified diameter and must be straight and round within the same limits. As a matter of fact, the effort is actually made to hold the cylinders to size within plus or minus 0.0002 inch.

Air-Conditioning Insures Uniform Dimensions at All Times

It is easy enough to say that work is being machined to such standards of precision, but to actually attain them throughout a day's run is quite another matter. When a shop starts up in the morning, the temperature in the machining departments may be 20 or 30 degrees less than it is at mid-day or in the afternoon, and the machines, tools, and work are cold.

It was found at the Ford Plant that although the cylinders were bored and honed all day long within the limits specified, they were not actually the same size, due to expansion of the tools and work caused by the temperature increasing throughout the day. The motors on the boring and honing machines aggregate 150 horsepower, and they alone throw off a large amount of heat that constantly increases the room temperature. Owing to this condition, when the engine blocks reached the assembly lines, pistons had to be selected to suit the individual cylinders.

In order to insure that the cylinders would be machined uniformly all day long and also to provide more comfortable working conditions for the men, it was decided to air-condition the cylinder boring and honing department. This department was completely isolated from the remainder of the building by constructing double-sash glass partitions on all four sides. An insulated ceiling was built about 14 feet above the floor. The room is thus completely sealed against the infiltration of air from the surrounding shop departments. It encloses about 70,000 cubic feet of space.

Conditioned air is now supplied to this sealed room from a central refrigerating plant which also serves two molding rooms in the foundry, the machine-shop trade school, the drafting-room, and the factory offices. In the cylinder room, the temperature during winter months is maintained between 70 and 75 degrees F. In the summer months, the temperature is kept about 15 degrees lower than outdoors.

In addition to supplying precooled filtered air to the department, the kerosene which is delivered to the boring tools is now precooled to between 55 and 60 degrees F., so as to prevent the tools and work from becoming hot. This is also true of the kerosene used in the honing operations. The kerosene is delivered to the boring tools with such force that it rises in a mist. These fumes are completely drawn away through large ducts which extend down to the machine fixtures. Each time a machine is started up, a switch is operated, which actuates a motor-driven fan in the corresponding exhaust duct.

The first objectives of this air-conditioning—uniform cylinders all day long and comfortable

working conditions—were at once achieved. It is no longer necessary to select pistons for the individual cylinders in the assembly of the engine units. In the cylinder department, the men do not become tired and hot, as they did formerly, with the result that they now keep up a faster pace and turn out considerably more work.

Another advantage of considerable economic importance derived from the air-conditioning of the cylinder department is that, because only filtered air is now in the department, dirt and soot do not settle on the accurate ways of the machines nor get into the bearings. These surfaces therefore remain accurate much longer than before, a fact which alone has saved a great deal in repair costs.

Increased accuracy of the work, greater output, more comfortable working conditions, and lower maintenance bills are therefore direct advantages that have been obtained by air-conditioning a machine shop department. The advantages far outweigh the cost.

Foundry Molding Rooms that Are Clean and Comfortable

Everyone in the metal-working industry is familiar with the dirty humid conditions generally existing in foundries; the feeling has always been that little could be done about it. The Ford Motor Co. has proved, however, that working conditions in sand molding rooms can be just as comfortable as in other shop departments. Two of the six molding rooms in the special castings department of the foundry have been air-conditioned, and the results have been so striking that the system is being extended to the other four rooms.

Each air-conditioned molding room has an area of 58 by 67 feet and a ceiling height of 16 feet. It is sealed with window sash and Gunite to make it air-tight. When the department is in full operation, about sixty men work in each of these rooms. A monorail conveyor brings empty flasks to the molding machines and carries completed molds to the melting furnaces. In the locations where the molds are filled with sand and adjacent to the different machines, the floor consists of iron grating. All excess sand falls through the grating and is delivered to overhead bins to be used again. Thus the floors are kept clean all the time. The woodwork and ceiling of the molding rooms are painted white and remain so!

Conditioned air fed constantly to the molding rooms keeps the temperature around 70 degrees F. in winter and, as in the case of the cylinder room, the summer temperature is about 15 degrees lower than outdoors. Cooled air carried by ducts to the conveyor lines is exhausted on the hot empty flasks as they return from the pouring room. This pro-

Ford Engineers Work under Conditions that are Conducive to Greater Efficiency. The Room Temperature is Always Comfortable and Drawings are not Soiled by Dirt or Dust in the Air

vision quickly reduces the temperature of these flasks. The men work in the molding rooms in complete comfort, and turn out more and better work than under the old conditions.

What Air-Conditioning Means to the Drafting-Room and Shop Offices

Before air-conditioning systems were installed in the drafting-room and the shop offices, where a total of about 311 men are employed, the temperature on a summer's day often rose to 100 degrees, and in the winter, the air was likely to become oppressive because of impurities. Under such conditions, men were likely to become drowsy or inactive as the day progressed. Also, there was always a certain amount of soot and dirt in the air, due to the closeness of the steel mill, foundry, river boats, and yard locomotives. Drawings and desk tops had to be brushed or wiped frequently to keep them clean. Often, drawings had to be redrawn, because of the dirt on them.

Since these departments have been sealed against the entrance of air from the outside and supplied with conditioned air, the draftsmen, clerks, and executives are able to put in a full day of activity without a feeling of lethargy. Men have even been known to stay at the desk or drawing-board after hours on a summer's day, simply because the temperature there was more comfortable than in their homes. They can now run a finger over desk papers or drawings without the sign of a smudge. Production drawings stay clean.

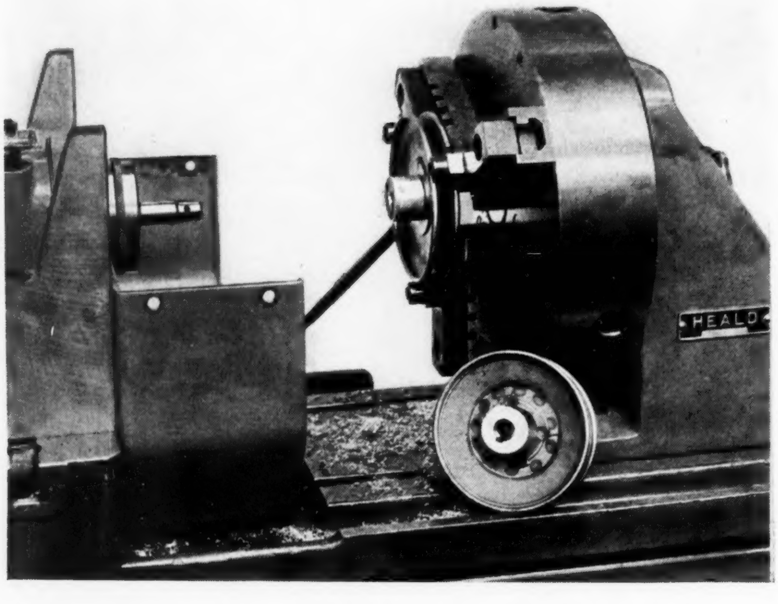
As in the cylinder department and in the molding rooms, air-conditioning has been found to pay in dollars and cents, because the men do more and better work under the more desirable conditions provided. Air-conditioning systems are being installed in the additional molding rooms, in a new chemical and metallurgical laboratory, in an X-ray room, in a brick laboratory, and in a first-aid room. It is evident that the Ford Motor Co. has found air-conditioning a practical means of increasing efficiency.

Producing Accurate Bores in Pressed-Steel Pulleys

THE machining of accurate bores in pressed-steel pulleys, a problem of considerable importance to the manufacturers, has been satisfactorily solved by the set-up shown in the accompanying illustration. With this set-up the work is held to closer tolerances than were possible with the machining methods previously employed and production costs have been lowered.

The machine used is a Heald No. 48 Bore-Matic equipped with a Cushman three-jaw chuck attached to a rigid cast-iron angle-plate, which is fastened to the machine table. This equipment is used for boring the hubs of pulleys having outside diameters ranging from 2 5/8 to 13 inches, with corresponding bores from 1/2 inch to 1 7/16 inches, and hub lengths up to 1 3/16 inches. These pulleys have pressed-steel sides, with the hubs made of soft screw machine stock.

The pulleys are located and held from the outside diameter by studs in the three jaws of the chuck. To dampen any vibration that might occur when boring the larger size pulleys, three rubber studs are provided, which centrally support the back of the pulley adjacent to the hub. This vibration dampener can be adjusted for any style pulley.



Set-up for Boring Shaft Holes in Pressed-steel Pulleys

* * *

Tests conducted by a contractor have proved that the application of Stellite to tractor brake-drums is both successful and economical. According to *Oxy-Acetylene Tips*, a set of drums that would cost $85 when new—each drum having a gear as an integral part—can be hard-faced and ground for $45 a set. While when this information was obtained, the hard-faced drums had not outlived their useful service, it was believed that they would outlast new drums by at least four times.

Grinding Wheel Truing Devices

Fixtures for the Accurate Control of Truing Diamonds, Used Advantageously in Conditioning Wheels for Grinding Precision Form-Turning Tools and Cutters

By WILLIAM C. BETZ, Equipment Engineer
Fafnir Bearing Co., New Britain, Conn.

PRECISION cutting tools for form-turning must be ground to shape after heat-treatment in order to produce accurate work. In form-grinding, suitable wheel-truing devices must be available. Sometimes a tool may be ground without any special devices for truing the wheel, as for instance, when grinding an angle on a tool. This can be done on any machine that has a wheel-head or a table that can be set so that the diamond may be passed across the wheel face at an angle or so that the work may be fed past the wheel face. For radius grinding, special radial-swinging wheel-truing devices must be used.

One of the smoothest working and simplest radius-truing devices known to the writer is shown in Fig. 1. This device has a hardened cone-shaped stud ground to an included angle of 20 degrees to fit a mating bushing of either hardened steel or hard bronze; hard bronze is used when the device is to be employed on a magnetic chuck to break up the friction caused by the magnetic effect on the steel parts.

To set the diamond to a true radius, the point of the diamond must be in the exact center of the rod and the rod bore must be machined central with the center stud of the base. A ground and lapped hole concentric with the center stud is used in connection with the diamond radius-setting de-

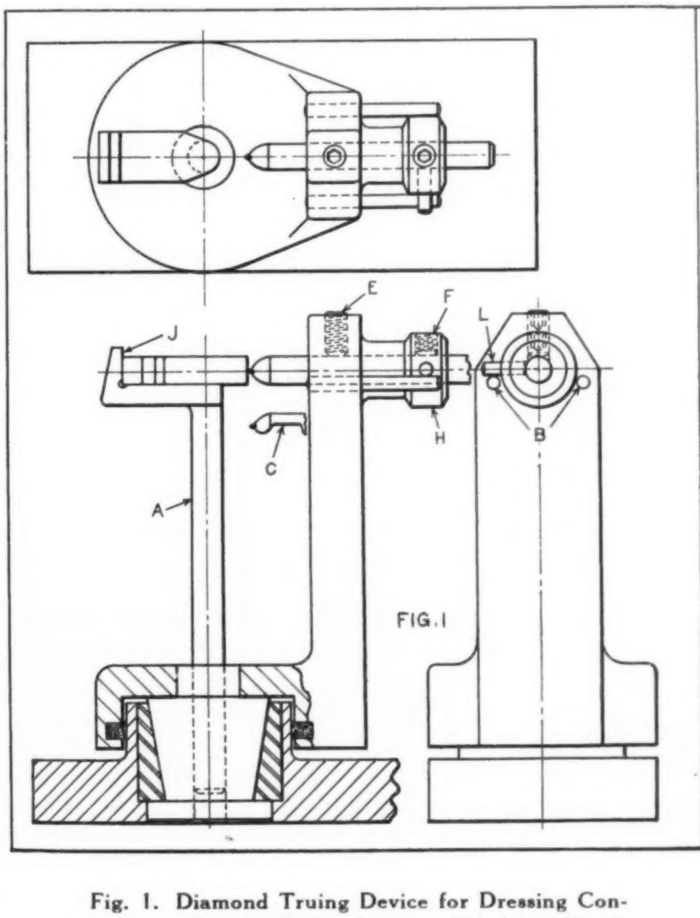


Fig. 1. Diamond Truing Device for Dressing Concave or Convex Radius-forming Grinding Wheels

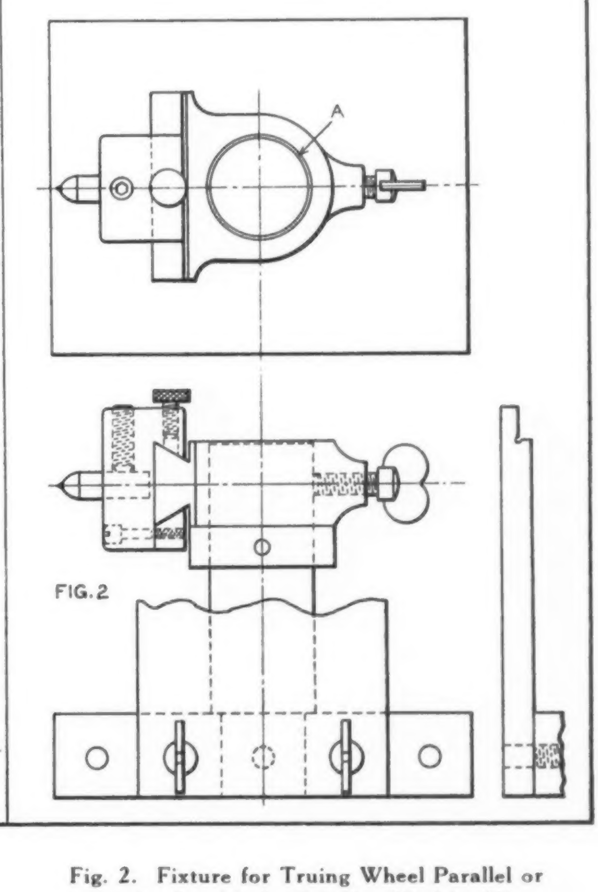


Fig. 2. Fixture for Truing Wheel Parallel or at an Angle with the Grinding Machine Ways

vice A, the shank of which is ground and lapped to a nice sliding fit in this hole. The face of the device at J is ground to a given distance from the center line of the shank; this distance is usually made 1 inch for convenience in setting to the radius required.

If the distance from J to the center line of the shank is 1 inch, then the diamond can be set for forming any concave radius up to 1 inch by using size blocks, the built-up blocks having a combined length equal to 1 inch minus the radius to be formed. The gage-blocks are placed on top of the gage so that one face of the blocks is in contact with J. The screws E and F are then loosened and shown in Fig. 1, the length of the radius required is added to 1 inch to obtain the total length built up by the size blocks. If the radius to be ground is larger than the radius of the shank A, so that no interference is met with in removing A from the base, the screw E may be fastened. Collar H can be fastened in place or left loose as desired, unless the device is to be used for truing a semicircle in the wheel face. In the latter case, collar H would have to be fastened, with the stop-pin L against one of the mating stop-pins B, and the face of H tight against the upright trunnion face.

Sometimes it is necessary to true an angle to blend with a radius; this is a tedious job unless a

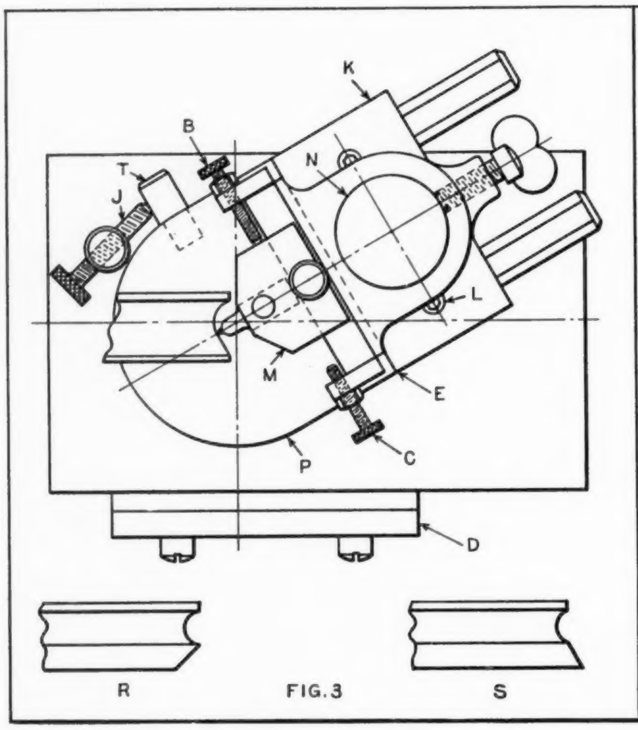


Fig. 3. Device Employed in Truing a Wheel for Grinding Form in which Angle Blends with Radius

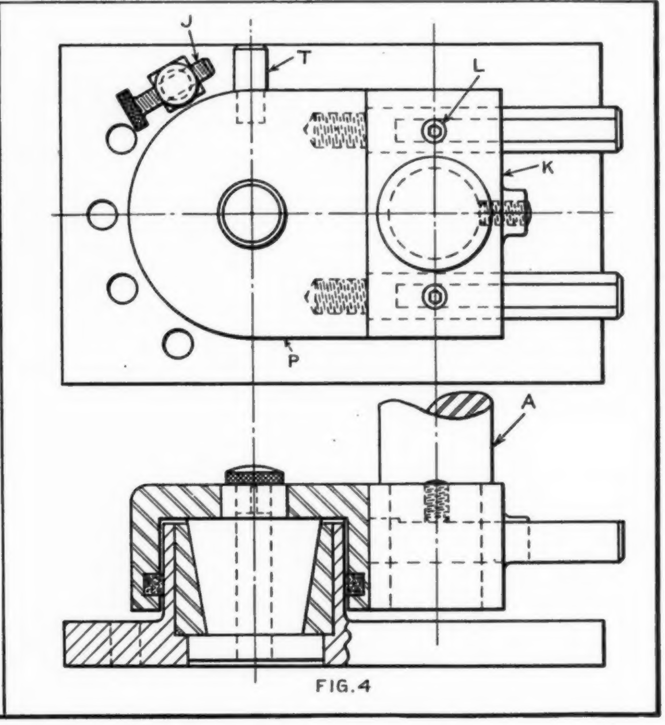


Fig. 4 Plan and Partial Section Views of Wheel-truing Device Illustrated in Fig. 3

the diamond-holder pushed back so that the diamond is in contact with the opposite face of the size blocks.

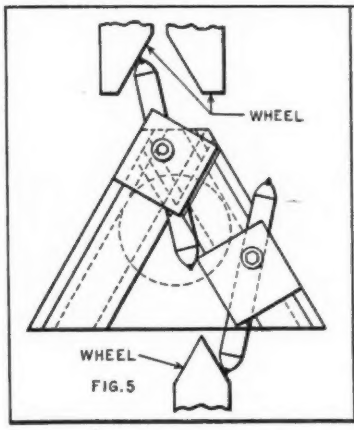
The face of collar H is then pressed against the trunnion of the upright and the screw F tightened. This locates the rod in the correct position relative to the size blocks. If the diamond overhangs the face of member A, it will be impossible to remove the latter member from the base without withdrawing the diamond. The diamond rod is therefore drawn back far enough to allow member A to be removed from the swivel-base bore. The diamond rod can then be slipped forward until collar H again makes contact with the upright trunnion. Screw E is now tightened to fasten the diamond rod in place.

To set the truing device for a convex radius, as special truing device is available, such as shown in the illustrations Figs. 3 and 4.

Truing a Wheel for Grinding a Form in Which Angle Blends with Radius

To set the angular slide of the device shown in Fig. 3, the center line of the diamond stud must be in line with the base swivel center. This position can be maintained by the use of two adjusting screws J, one on each side of the stop T. To set the angular slide, the plate D is clamped to the side of the base, and the slide position is set by the aid of a bevel protractor.

If extreme accuracy is required, the slide can be set by the aid of a sine bar. To do this, the face is clamped to an accurate angle-iron, the back edge



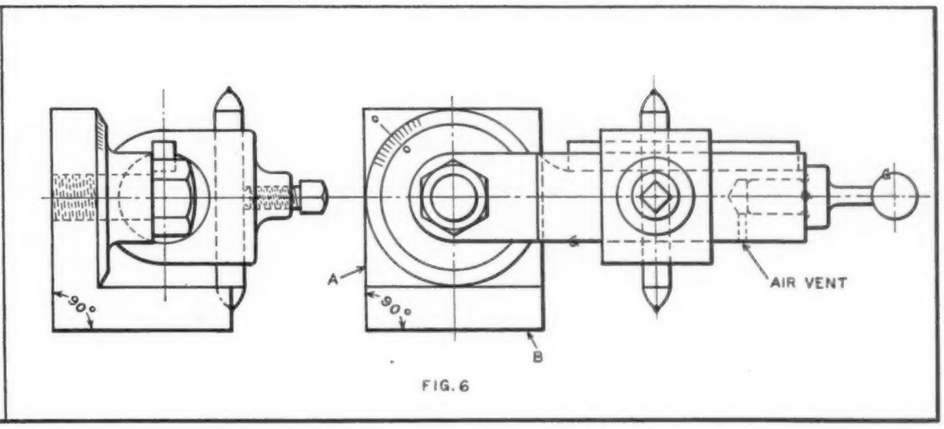


Fig. 5. Device for Dressing Convex and Concave V-shaped Wheels

Fig. 6. Diamond Truing Device with Graduated Disk for Truing Surface Grinding Wheels Parallel or at an Angle with Axis

of the base resting on the surface plate and the top of the sine bar being in contact with the back of the slide shown.

After setting the angular slide *M* at 90 degrees with the side of the base, the stop *J* must be set to stop *T* at the angle through which swivel base *P* must travel to true the radius on the wheel; when this stop is reached, slide *M* is drawn away from stop *B* toward stop *C*, which trues the angle and radius in one complete motion. In setting up for truing, the diamond-holder rod should project far enough so that in swinging the fixture for the radius, the wheel cannot come in contact with the face of the wheel-slide to mar it.

The slides and pedestals *A*, in Figs. 2 and 4, are almost identical. Provision for adjusting the fixture for truing or forming concave surfaces of larger radii has been made on the fixture shown in Fig. 4 by incorporating two rods in the upper part of the fixture to allow the base *K* to be adjusted in or out. Base *K* is locked by two setscrews *L*.

There are some cases where a radius and an angle are required and the angle must intersect the radius, as shown at *R* and *S* in Fig. 3. In such cases, the stop is set to permit the radial base to swing through the arc required, and the angular slide is adjusted on its stud *N* for the angle desired. The radius is then formed in the wheel, and the slide is drawn back to produce the angle in correct relation to the radius.

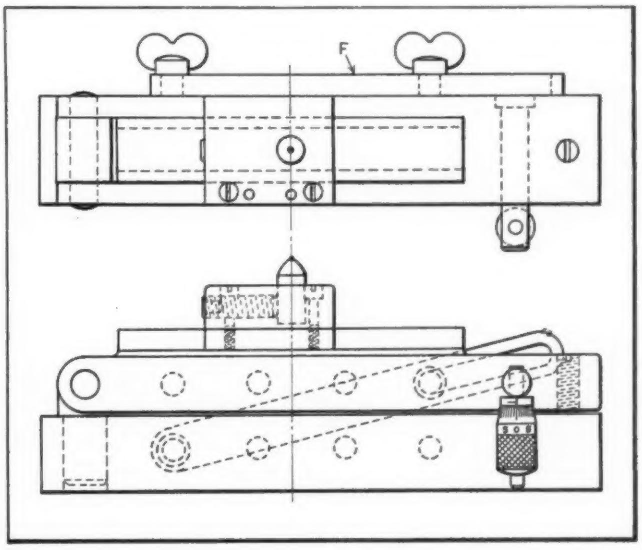


Fig. 7. Wheel-truing Fixture with Sine Bar Arrangement for Making Accurate Angular Settings

Then, again, an angular surface may be required that is located parallel to the tangent of a given radius and at a given distance from the tangent line. In this case, the diamond must swing through the arc required, stop *J*, Fig. 3, being set as if to true the angle tangent to the radius; after this the back slide screws are loosened, the slide is pulled away from the main swivel base *P*, and size blocks are inserted between *P* and *K* at *E* to locate the diamond the required distance from the tangent line. The slide screws are then tightened and the angle is produced on the wheel.

The fixture shown in Fig. 2 is used to true wheels either parallel with the machine ways or to any angle of a circle. The slide is set the same as the one shown in Fig. 4 by protractor or sine bar. In production work, it is sometimes necessary to true two angles in relation to each other, and the work must be done rapidly. A special wheel-truing device for this purpose which has two slides is shown in Fig. 5. This may be used to form a convex or a concave V-shape in a wheel face by using the slides with either the small end or large end of the base facing the wheel.

Fixtures for truing wheels on surface grinding machines are shown in Figs. 6 and 7. The slide bar shown in Fig. 6 is set to the required angle through the graduated disk, or if extreme accuracy is required, it can be provided with a ball in the end of the bar as shown, to be used as a sine

bar with size blocks. This ball may be removed if it interferes with wheel guards or fixtures. The center-to-center distance between the ball and the swivel stud is 5 inches; the ball and stud diameter must be of exactly the same size for accurately setting to sines of angles. For setting the slide bar to angles less than 45 degrees with the base *B*, the size blocks are placed on the surface plate under the ball. For angles greater than 45 degrees, the device is set up on edge *A*. If an angle of 75 degrees is required on the side of the wheel, for example, the slide bar is set at an angle of 15 degrees from surface *B* and then turned on edge *A* for truing the wheel.

Sine Bar Type Truing Fixture

The truing fixture shown in Fig. 7 can be set either by the inside micrometer head, which is mounted in the swiveling pin in the slide, or by size blocks placed under this pin. In either case, the blocks or head can be removed after setting and clamping the slide in position with the strap *F*.

All the diamond-holder slides shown are of the "push-pull" type operated by hand without levers, racks, pinions, or screws. With these hand-operated slides, it is much easier to feel the cut of the diamond on the wheel surface. Also, the fixtures are cheaper to make and there are fewer parts to wear and give trouble.

It is understood that in order to produce accurate shapes in wheel faces, the diamond point must be set on the exact center line of the wheel. If this is not done, the contours and angles on the work will be distorted. To true a wheel face to a semicircle is the most difficult truing operation. It is impossible to do this with a set diamond-holder, as the diamond cannot be swung through 180 degrees without grinding the sides of the diamond holding rod. This truing can be done, however, by making the holder so that it can be swiveled through 180 degrees and making the rod as shown in Fig. 1 at *C*.

In mounting the diamonds for radial truing, especially when the rod must be turned through an arc, the diamond point should be on the exact center of the rod. Firms selling and setting commercial diamonds will point diamonds dead true with the rod centers at slight cost. When the truing devices are to be used on magnetic chucks, it is best to make the diamond slides of hard bronze to prevent the binding action that takes place in magnetized steel and iron parts.

* * *

Even when machine tools apparently operate satisfactorily, if a survey reveals that their production capacity is below par as compared with newer equipment, the machines ought to be immediately written off the books, discarded, and replaced, because they are a liability.

Was This an Early Type of Ball or Roller Bearing?

By ARTHUR H. MORSE

The following is quoted from the *London Magazine* of August 30, 1758: "A remarkable carriage set out from Aldersgate Street for Birmingham, from which town it arrived the preceding Thursday full of passengers and baggage, without using coomb, or any oily, unctuous, or other liquid whatever, to the wheel or axles; its construction being such as to render all helps of that kind useless. The inventor has caused to be engraven on the boxes of the wheels these words: 'Friction Annihilated,' and is very positive that the carriage will continue to go without greasing as long and as easy as, if not longer and easier than, any of the stage carriages will do with it. This invention, if really answerable in practice, is perhaps the most useful improvement in mechanics that this century has produced."

It seems reasonable to assume that friction was "annihilated" by means of some type of ball or roller bearing, although, as far as is known, there is no record of the bearing referred to having been used for any other purpose than that mentioned in the quotation above.

* * *

History Repeats Itself in a World of Economic Illiteracy

"All-important as this question is [the question of recurring business depressions], it has not yet received a solution which accounts for all the facts and points to any clear and simple remedy. This is shown by the widely varying attempts to account for the prevailing depression. Upon high economic authority we have been told that it is due to over-consumption; upon equally high authority that it is due to over-production; while the waste of war; the attempt of workmen to keep up wages; the issue of paper money; the increase of labor-saving machinery, etc., are separately pointed out as the cause by writers of reputation.

"And while professors thus disagree, the ideas that there is a necessary conflict between capital and labor, that machinery is an evil, that competition must be restrained, that wealth may be created by the issue of money, that it is the duty of government to furnish capital or to furnish work, are rapidly making way among the great body of the people. Such ideas, which bring great masses of men under the leadership of charlatans and demagogues, are fraught with danger."—No, this is not an extract from a current campaign speech; it was written in 1877 and is part of the introduction to "Progress and Poverty," by Henry George. Again history has repeated itself, because we have failed to learn by past experience.

What to Specify in Buying Press Dies

By JOHN RELYEA, Superintendent, Maxwells Ltd.
St. Marys, Ontario, Canada

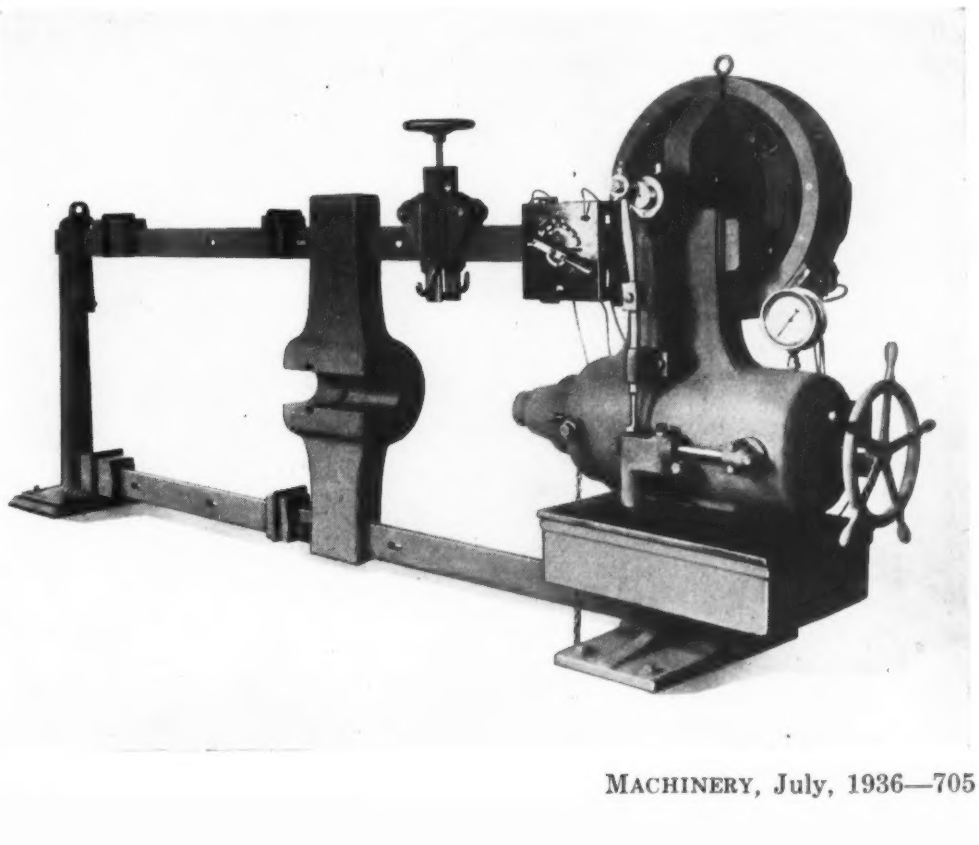
In many plants, the tool-room, though able to meet any ordinary requirements, cannot always cope with sudden demands for extensive tooling, such as required in bringing out new models. Then, tools must be ordered from outside shops. If such orders are of infrequent occurrence, the specifications may be loosely drawn, and as a result the purchased tools may not come up to expectations. As a safeguard against this, a set of rules entitled "Instructions to Die Vendor" was drawn up. This set of rules, which has proved useful in preventing misunderstandings and errors, contains the following instructions:

1. The bid price is to cover the construction of dies that will make the pieces required on a production basis in such of our presses as are specified.
2. The vendor must make sure that the construction of the die is suited to the press in which it is to be used, as specified by us.
3. The vendor must know the kind of stock that will be used, the method of feeding the stock, and must get samples of it from us, if required.
4. The delivery date for each die must be given.
5. The materials specified must be used for the die construction.
6. Specified die sets are to be used wherever possible.
7. The tool steel used must be the same as our shop is using, or be as specified by us.
8. The part number and name of the piece are to be stamped on the die set.
9. If any changes in the dies are found necessary, as compared with the tool drawings, information must be given us before such changes are made, and sketches showing the changes must be supplied, if required.
10. In most cases, sample parts should be submitted before the dies are finally hardened.
11. Sketches of the tool must be submitted before the contract is awarded in cases where the tool drawing is not supplied by us.
12. Drawings must accompany the finished tool in all cases where we do not provide the design.
13. Our shop practice must be followed as regards bushings, pilot-pins, and stops.
14. The thickness of the die plate must be as given on drawing.
15. "Filing out" must be so done as to insure maximum die life.
16. Dies must be tested for hardness as specified.
17. The vendor's quotation must state that conditions as outlined in this instruction sheet will be met, and must give delivery date and price.

* * *

It was predicted by Charles H. Chatfield, research director of the United Aircraft Mfg. Co., in an address before the S A E, that transport airplanes, in the next few years, will seat from 30 to 40 passengers for daytime travel, while transoceanic planes will have sleeping accommodations for 30 persons.

When we pass through the machine shop of today, it is difficult for us to imagine that only forty years ago electric motors were a novelty in the shop. The illustration shows an early application of an electric motor to a shop tool. This Niles 100-ton hydraulic press was built in 1895, and supplied with a motor built in 1894 by the Card Electric Motor & Dynamo Co., Cincinnati, Ohio, which later became the Bullock Electric Co. and is now a part of the Allis-Chalmers Mfg. Co. This press was recently presented to the University of Cincinnati to be kept as a record of engineering developments.



Designing Cams for Automatic Screw Machines

By I. A. SWIDLO, Ordnance Engineer
Springfield, Mass.

Procedure Outlined in a Set of Instructions that have been Used Successfully in Training Tool Designers for Automatic Screw Machine Work — Second Installment

THE first installment of this article appeared in June MACHINERY, page 641. This, the second and final installment, will deal with additional calculations required in the design of automatic screw machine cams. The first subject to be considered is the determining of the feed per revolution for each tool and the calculating of the number of revolutions necessary for each cutting operation.

The rate of feed depends on the material cut and the finish and accuracy required. It is good practice to use a fine feed and a high spindle speed for all cutting tools. The feeds given in Table 2, published in the first installment, on page 642 of June MACHINERY, are recommended as a guide. These feeds were taken from actual practice. Each individual case should be carefully considered.

To find the number of revolutions required for each cutting operation, divide the calculated cam throw by the feed per revolution for all tools except taps and dies.

The cutting speed for threading and tapping is much slower than for other operations. It is necessary to calculate the number of revolutions at the spindle speed originally adopted which would be equivalent to the number of revolutions necessary for threading or tapping. Usually the speed of the spindle is increased at the end of the threading or tapping operation, when the spindle is reversed. Assuming that,

N = number of revolutions per minute of the spindle for threading or tapping part to be produced;

R = number of revolutions required for running die on or feeding the tap in;

N_1 = number of revolutions per minute of the reverse or originally selected spindle speed; and

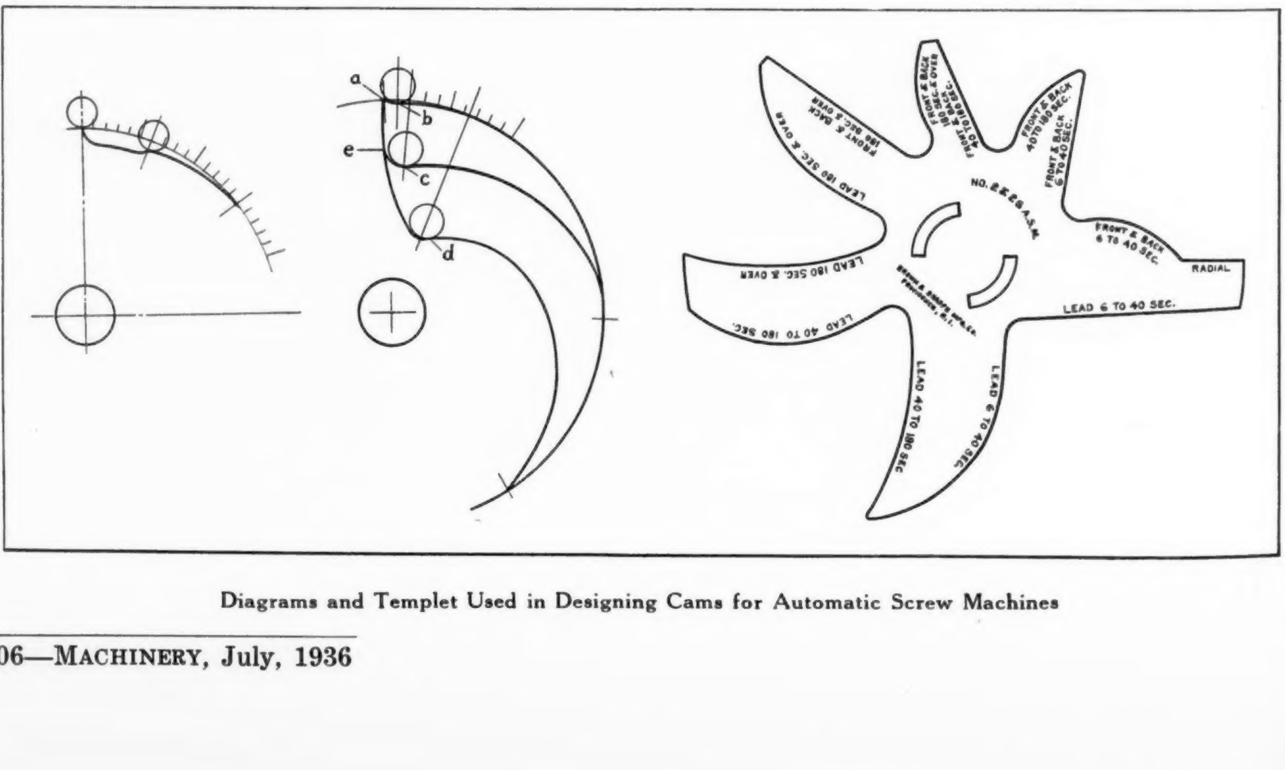
R_1 = number of revolutions at normal spindle speed or reverse that is equivalent to R in terms of time.

Then

$$\frac{R_1}{R} = \frac{N_1}{N} \quad \text{or} \quad R_1 = \frac{N_1}{N} \times R$$

Calculating the Total Number of Working Revolutions Required to Make One Piece

To find the total number of actual working revolutions required to make one piece, it is necessary to add the number of revolutions required for each



Diagrams and Templet Used in Designing Cams for Automatic Screw Machines

actual working operation, such as turning, drilling, reaming, threading, etc., which total may be represented by A. Care should be taken not to include overlapping operations twice; that is, if forming is done during a drilling operation, the forming operation should not be counted.

We now proceed to find the total number of hundredths of cam surface required for the idle movements, such as feeding stock, indexing turret, etc. Owing to the fact that the clutches for operating the chuck, feeding the stock, and indexing the turret are mounted on a constant-speed shaft, these operations are always performed in the same length of time, regardless of the spindle speed. As the time required to make one piece increases, the lead cam, which controls the work of the turret tools, will revolve more slowly. The speed of the lead cam may finally be reduced to a point where the space available on the cam for feeding stock or indexing the turret will not permit the cam-lever roll to drop to the depth required for bringing the next tool to the starting position. Thus, the time required for feeding the stock or indexing the turret becomes the factor governing these movements on jobs requiring longer periods of time.

Examples Illustrating the Procedure

Reference to the view at the left in the illustration will assist in making clear the conditions described in the preceding paragraph. In this view, six hundredths of the cam surface is allowed for indexing on rapid work, and represents more space than is necessary to permit the lever roll to slide down from the top of one lobe to the start of the next. It is impossible to reduce this space, as six hundredths, in this case, represents the time actually required for the mechanism to operate.

In the central view are shown portions of cam profiles used for much slower jobs, where the cam surfaces control the time required for indexing. In passing from the top of one lobe to the start of the next, the lever roll travels down a definite curve, which is as steep as possible without permitting the roll to drop to the bottom. The curves of drop, and likewise the curves of rise, for jobs that can be done within a certain time limit or number of seconds are given on a cam templet supplied by the Brown & Sharpe Mfg. Co. for each size of its automatic screw machines. One of these templets for a No. 2 machine is shown in the view to the right.

For example, let it be assumed that the templet line of drop for jobs requiring from 40 to 180 seconds as shown on this templet is to be used. In this range, one hundredth of the cam surface may be equivalent to more seconds than are actually required for indexing. For instance, assume that the time required to produce a given piece is 180 seconds. Taking the fastest speed of the machine to be 1200 revolutions per minute, it will require 3600 spindle revolutions to make one piece. One hundredth of cam surface would represent 36 spindle revolutions. The actual time required for the indexing mechanism to operate is one second. Therefore, at 1200 revolutions per minute the spindle will make 20 revolutions in one second. Even if a few more revolutions are added to allow for setting the trip dogs, making it 24 revolutions, there are still 12 more revolutions than are actually necessary for indexing.

Now if the central view of the illustration is examined, it will be noted that one hundredth of cam surface permits only a slight drop of the roll from a to b. If it is necessary for the roll to drop approximately half way down, or from a to c, two hundredths will be required, and for a drop to full depth, from a to d, six and one-half hundredths of cam surface is necessary for indexing. The special table "Hundredths of Cam Surface for Feeding Stock and Indexing," compiled by the Brown & Sharpe Mfg. Co., should be applied only for those jobs governed by cam surface requirements.

For rapid jobs, the indexing and stock feeding movements are accomplished within the time actually required for these operations and are usually considered equivalent to the number of spindle revolutions within that time plus a few extra revolutions to allow for setting the trip-dogs that operate the mechanism.

The problem of clearances and interferences of turret tools with the forming tool, cut-off tool, or work itself must next be considered. It is necessary to be assured of safe clearance, but it is also good practice to avoid any time loss in the sequence of operations, as the loss of even a fraction of a second, when multiplied by the hundreds of thousands of pieces produced, becomes an important factor in production costs. Thus it pays to give careful attention to clearances in designing the cams. The "Diagram-Model" described in December, 1926, MACHINERY, page 281, was designed for use in checking the clearance of automatic screw machine tools and for developing lead cam profiles under conditions in which the actual tools and tool movements are duplicated. After establishing the number of hundredths of cam surface required for feeding the stock, indexing the turret, and for clearance, these values are added together and the total designated B.

Finding Number of Working Hundredths of Cam Surface and Number of Spindle Revolutions Required in Making One Piece

As the cam surface is divided into 100 spaces which represent one complete cycle for making one piece, and all idle movements require B hundredths, then the actual working operations will require $100 - B = A$ hundredths of cam surface.

If the total number of revolutions is designated T, we know that this number should be equivalent to one revolution of the cam or its total number of hundredth spaces. From this we have:

$$T : 100 = A : (100 - B)$$

$$T = \frac{100 \times A}{100 - B}$$

After finding T ("estimated" total number of spindle revolutions to make one piece), it is necessary to check this figure with the actual number of revolutions available with the regular change-gears and select those that come nearest to giving the estimated number. Regardless of whether the next largest or next lowest number is chosen, it is necessary to readjust the spindle revolutions of some of the operations to correspond to the total number of revolutions available on the machine.

Finding the Time in Seconds Required to Make One Piece

Let S = time in seconds required to make one piece;
T = total number of revolutions required to make one piece; and
N = number of spindle revolutions per minute.

Then

$$S = \frac{T}{N} \times 60$$

The time S could also be found in tables supplied with each machine for laying out cams when T is found.

In order to calculate the number of hundredths of cam surface for each operation, let

H = number of hundredths of cam surface required for any cutting operation;
N = number of revolutions required for any cutting operation; and
T = total number of revolutions required to make one piece complete.

Then

$$H : 100 = N : T$$

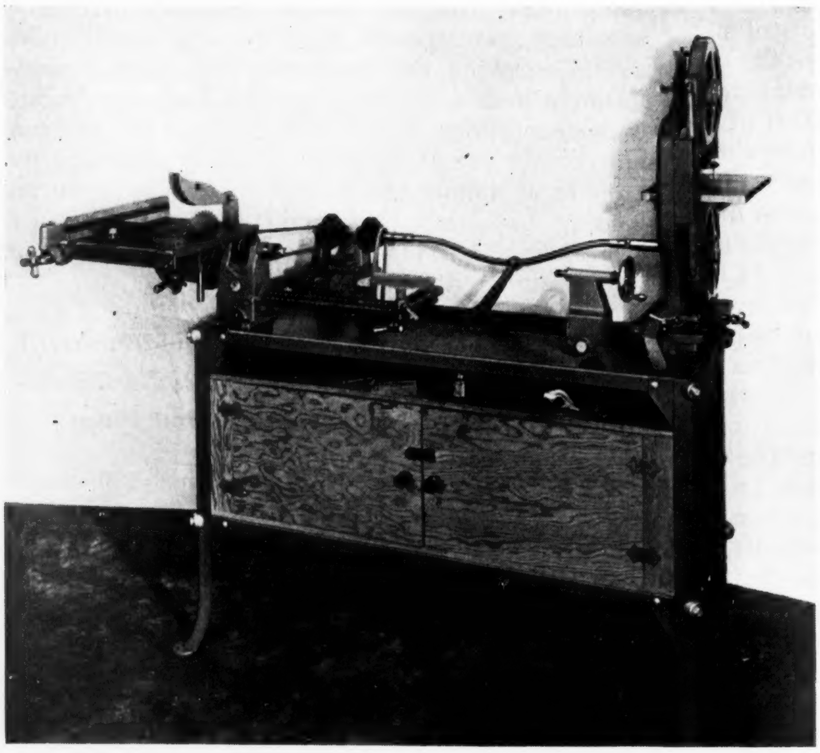
$$H = \frac{N}{T} \times 100$$

Each particular hundredth division mark on the lead cam circle at which the cutting operations and idle movements of the turret-slide begin and end should be indicated in their proper sequence as outlined in the first installment of this article. The same procedure should be followed in locating the lobes on both the front and back cross-slide cams.

It is important that the heights of the cam lobes be within the limits determined by the minimum distance from the face of the chuck to the face of the turret. This minimum distance when using regular size lead cams is given in the table of specifications for each machine.

In case it is necessary to stop the turret tool at a greater distance from the chuck than that given in the specifications for the machine, in order to provide space for the tools and to complete the machining operation required, the lead cam is usually cut down to a smaller diameter on some or all of the lobes.

The minimum distance between the turret and chuck on the Nos. 00 and 00G machines is 1 5/8 inches; on the Nos. 0 and 0G machines, 2 1/8 inches; and on the Nos. 2 and 2G, 2 1/2 inches. It is necessary to note that the length of the piece added to the length of the tool in the turret must be less than the greatest distance between the turret and chuck, as otherwise, a reduction in the diameter of the lead cam would be required. This distance for the Nos. 00 and 00G machines is 3 inches; for the Nos. 0 and 0G machines, 5 1/8 inches; and for the Nos. 2 and 2G machines, 6 3/4 inches.



The Walker-Turner Add-A-Tool Equipment Intended for Home Work-shops. In the construction of this machine, thirty-nine zinc-alloy die-castings are used in the headstock, tailstock, band-saw wheels and guards, pulleys, etc. Both the band-saw and the bench-saw tables utilize die-castings for the somewhat complicated parts necessary to allow them to tilt to the angle required. The quadrants are also made from die-castings to insure clear, legible figures without costly machining. The machine was on exhibition at the recent Die-casting Show at Rockefeller Center, New York.

Lubrication of Ball and Roller Bearings

What Lubricants are Suitable for Ball and Roller Bearings? What Characteristics are Required of the Oils and Greases?

By H. T. MORTON, Metallurgist
Hoover Ball & Bearing Co., Ann Arbor, Mich.

LUBRICATION in ball and roller bearings serves a different purpose than in journal type bearings. In the latter, the shaft revolves and slides in the journal, and there must be a film of lubricant between the shaft and journal to prevent excessive friction and seizing. With "anti-friction" bearings, there is a rolling motion of the balls or rollers on the surface of the races, which reduces the sliding friction to a minimum.

The actual areas of contact between the balls or rollers and the races are very small. In the case of balls they are small ellipses, and with rollers they are small trapezoids. Because of this small total contact area, the loads per square inch are unusually high and the greater part of the lubricant is forced out of the contact space during the rolling operation. Thus it is seen that a very clear lubricant, free from any hard particles that might become lodged between the balls or rollers and the races is necessary.

Purpose of Lubrication in Ball and Roller Bearings

The lubricant in a ball or roller bearing serves four distinct purposes: (1) It reduces the friction between the balls or rollers and the retainers to a minimum, and minimizes other sliding friction in the bearing. (2) It acts as a covering for the bearing parts, preventing corrosion. (3) It acts as a medium for conducting away heat generated by the bearings. (4) It effectively seals the bearing from the entrance of dirt, metal chips, water, dust, or other foreign matter.

It is obvious that in bearings of this type there is very little space for a lubricant between the balls or rollers and the races, unless the lubricant has a high film strength to resist the high unit pressures. Both oils and greases are used for such bearing lubrication, the choice depending entirely upon the design of the housing in which the bearing is located.

Oils and Greases Used for Ball and Roller Bearing Lubrication

For oils there must be a slow positive feed and as positive a seal to make sure that the oil does not leak into the motor or other parts of the machine in which the bearing is located. The amount and consistency of the oil will depend upon the size of the bearing and the load, speed, and temperature; but it should have a high enough film strength to stay on the bearing surfaces, and yet not have too much internal friction.

For some applications, castor oil has been found to be better than a mineral oil or grease. Fatty oils must be avoided, because they become rancid and acidify, causing corrosion of the bearing parts. Castor oil is used especially for high speeds or heavy-duty bearings in airplanes, racing cars, special gear assemblies, etc., because it has the advantage of high uniform viscosity without change after long periods of service. Its disadvantages are a high initial cost and a disagreeable odor.

Greases require less attention from the operator in order to maintain the same lubrication results as are obtained with oils, but they should be replenished at regular intervals, regardless of the service conditions of the bearings. The replenishing of the grease in an active bearing removes the old grease and any metal chips or dirt that have accumulated, and also provides a good seal to prevent the further entrance of dirt and dust. Replenishing the grease in an inactive bearing keeps the grease fresh and eliminates caking, which sometimes occurs with lime-soap greases or others containing a high percentage of moisture.

Cleanliness Most Important in Handling Greases

Certain precautions are necessary for the proper greasing of bearings. Some suggestions are given below:

1. Buy the grease in small containers, so as to avoid leaving a grease can open for infiltration of dust and dirt. It is suggested that a sign be placed on the containers and in the grease room stating: "Keep Covers Tight on All Grease Cans. Thoroughly Clean All Dishes Used for Grease. Keep Grease Away from All Dust, Dirt, and Metal Chips."
2. Have a clean room or portion of a room for grease storage, with a solid wall between any air hammers, grinders, machines creating dust or metal chips, etc.
3. Have a clean room or portion of a room in which to store the bearings, with a wall between any air hammers, grinders, etc., or machines creating dust or metal chips. Keep the bearings in their original packages until they are ready for the greasing and assembly work.
4. Have a clean assembly room in which the bearings are

greased, placed on the shaft, and assembled in the machine. Do not convey the shaft and bearings to a different room unless they are fully protected and covered to avoid contamination by dust or dirt.

5. Clean the housings thoroughly, so that they are free from dust, metal chips, foundry sand, etc. It is suggested that the portion of the housing in which the grease is to be stored be given a coat of paint or shellac, so that no further sand or metal particles will fall off from the castings and contaminate the grease. All this cleaning and painting should be done in another room from that in which the grease or bearings are stored, or the assembly operation takes place, to prevent dirt, dust, or metal chips from causing trouble.

6. The cleaned and painted housings should be stored in a clean room and kept properly covered or sealed from dirt or dust particles.

7. Have a standard method of greasing the bearings, either by a grease gun, pump, etc., from which the grease comes out as needed, and the surplus is well covered and free from contamination. Several reliable manufacturers make such greasing equipment. The amount of grease in a bearing is important, because an excess will cause internal friction and overheating. Therefore, the bearing should be filled one-third to two-thirds full, depending upon the grease used and the operating conditions.

8. The persons on assembly work must keep their hands and all parts that might come into contact with the bearing or grease absolutely free from dirt, dust, metal chips, or foreign particles.

9. Rigid instructions should be issued to all machinists and maintenance men relative to handling grease in a clean manner, cleaning all grease nipples before adding grease with a gun, cleaning all grease cups before refilling them, etc. Regular periods for renewal of grease should be adopted for all ball and roller bearings. In general, this interval might be a period of one to three months, depending upon the grease used and the service conditions.

10. Occasionally, bearings are heated for easy assembly on the shaft. An electrically heated or gas heated oven is to be preferred, the temperature of which cannot exceed 275 degrees F., with the bearings heated in their original wrappings, free from contamination by dust or dirt. If an oil bath is used for economic reasons, the bath should be tightly covered all of the time, and the oil should be thoroughly filtered at regular intervals to remove all dust and dirt.

Some Pointers on the Choice of Grease

As outlined earlier, there is only a thin film of lubricant between the balls or rollers and the races, which prevents friction at these areas, and a similar thin film between the balls or rollers and the retainers. In most cases, this is only a film of oil, even when grease is used for the lubricant. Therefore, the quality of the grease is dependent upon the quantity and quality of oil in it.

Most greases contain oil and soap with or without other fillers. The soap and fillers are used merely as a sponge to hold the oil in the bearing and prevent its loss. The important point is to get the proper kind of soap to maintain the same fluidity for long periods of operation without loss of oil or change of grease characteristics. This is the problem that ball bearing and lubrication engineers have been studying for a long period of years. The particular characteristics of a good grease have been summed up by Maurice Reswick as follows:

1. Uniform Quality—The grease must be clean and free from injurious fillers and foreign abrasive matter. Uniformity of product must be maintained, so that the consistency, homogeneity, and other properties, shall not vary in different lots not purchased at the same time. The container in which the grease is packed and shipped must be perfectly clean and free from scale or other dirt.

2. Stability—Ball and roller bearing grease must not disintegrate nor separate while standing or in service. In inferior greases, the soap thickener often separates out and is deposited in a hard layer around the outer race, while the lighter oil is lost through leakage or volatilization. This causes channeling, and leads to damage of the bearing. Loss of moisture from some greases will harden the soap; these greases should be avoided.

3. Absence of Fillers—No fillers like graphite, talc, pumice, rosin, free lime, etc., should be contained in the grease. Solid substances like graphite have a tendency to settle out, accumulating in the grooves and obstructing the free rolling motion of the balls and the rollers.

4. Non-Corrosiveness—The grease must not corrode the highly polished bearing elements and must not contain any active free acids or alkalies. The action of an acid or alkali etches or pits the polished surfaces of the balls or rollers and races, and accelerates rusting. The compounded grease must be free from uncombined fats and alkalies which have a detrimental action on steel.

5. Gumming and Hardening—Whether standing or in operation, the grease should not become gummy or sticky. There should be no tendency toward oxidation or hardening of the grease. The soft consistency of the grease should be maintained at all times, so that the starting torque will be at a minimum.

6. Temperature Characteristics—The ideal grease is one that could be used for operating temperatures from minus 40 degrees F. to as high as 300 degrees F. without liability of excessive stiffening at the lower temperature or too great fluidity at the higher temperature. While a grease that will meet these ideal requirements has not yet been fully perfected, certain greases on the market approach it quite closely. In this respect, greases are superior to mineral oils, because their temperature characteristic curves are flatter; and where an oil would become very thin at high temperatures, certain greases still maintain a reasonable consistency which prevents loss through leakage.

Types of Greases Available

Grease is essentially a combination of mineral oils with fatty oil saponified by lime or soda. The requirements for general ball and roller bearing lubrication are best met by soda-base greases, which have greater stability and are less affected by agitation and variation in temperatures than lime-base greases. A properly combined soda-base grease may become semi-liquid at extreme temperatures, but will regain its consistency on cooling, while a lime-base grease will often break up under the same conditions. The melting point of a soda-base grease is considerably higher than that of any other type. Either a non-fibrous or a short-fiber soda-soap grease is to be preferred to a long-fiber grease, because of its lower internal friction.

When there is a likelihood of water or moisture getting into the bearing, lime-base greases are preferred, for the reason that soda-base greases tend to emulsify, forming a soap lather, while lime-base greases are water-repelling. This accounts for the fact that in the lubrication of large roller bearings on the necks of rolling mills, where the speeds are comparatively low, a lime-base grease containing a high-viscosity oil is generally used.

The consistency or proportion of soap to oil in

the grease, and the viscosity of oil in the grease will vary according to the operating conditions—load, speed, bearing size, and temperature. Most reliable oil companies have a group of greases best suited to ball and roller bearing lubrication, and can make recommendations.

The use of fillers to increase the film strength in lubricants, although not advisable for ball or roller bearings, might become necessary in extremely heavily loaded bearings. In general, they act as fine abrasives, wearing away the surface of the balls or rollers and races, but this effect might be negligible in comparison with the scoring and seizing action that would result if they were not used in heavily loaded bearings.

The mixing of heavy and light grease, or two makes of grease, should be avoided. Chemical reactions, foaming, corrosion, and other difficulties may arise, as well as trouble from lack of uniformity of the mixed grease. Purchase a grease of the proper kind and consistency for the bearings directly from the grease manufacturer.

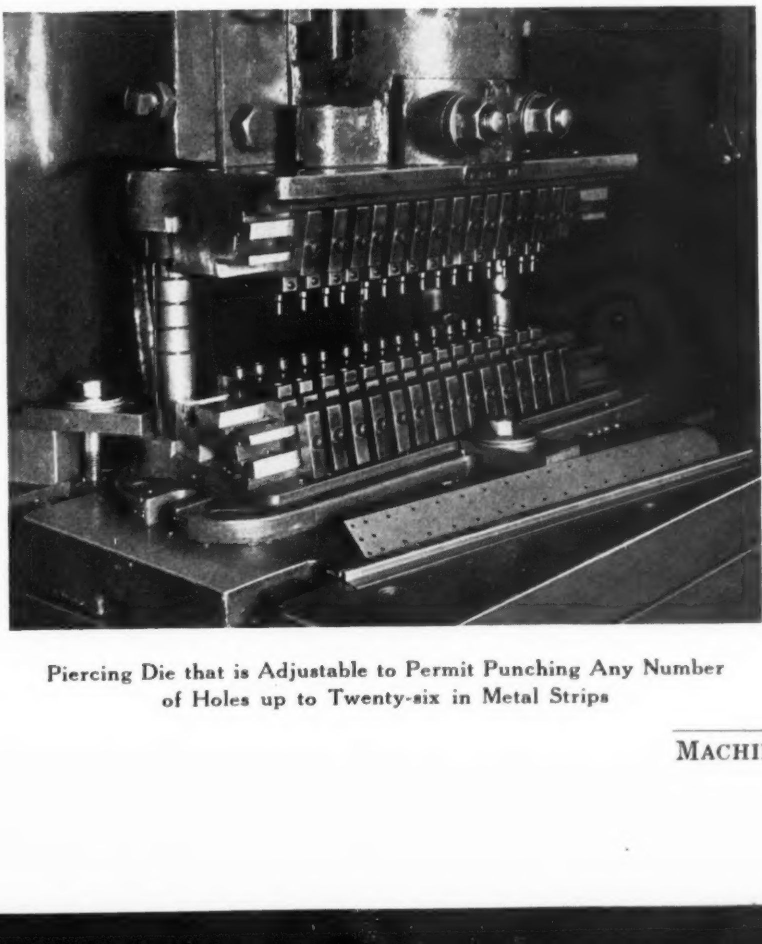
An Adjustable Multiple Piercing Die

STRIPS of sheet metal with holes spaced at different center distances are required frequently in the construction of airplanes at the plant of the Curtiss Aeroplane & Motor Co., Inc., Buffalo, N. Y. Duplicate pieces are generally wanted in such small quantities that it would not pay to make a multiple piercing die for each job. At the same time, the pieces must be interchangeable, and so an accurate method of punching the holes is necessary.

The illustration shows a punch and die set that was developed to provide for punching any number of holes in the metal strips to the required center-to-center distances. Individually adjustable punches are mounted in holders on a unit that is attached to the ram of the press. As many of the punch-holders as may be required can be positioned horizontally anywhere along the rail and firmly locked between a dovetail surface of the rail and a C-clamp, also mounted on the rail. This clamp grips against a tapered surface on the front side of the punch-holder. Each clamp is held in the desired setting by tightening a hollow-head set-screw which engages a T-shaped nut that enters a slot in the face of the rail.

A templet, such as seen lying in front of the die, is used to locate the punches correctly for each job. The punches are adjustable in their holders for height.

Dies to suit the punches are mounted on a block fastened to the press table. These dies are locked to a rail by C-clamps which are applied in the same way as the punch-holder clamps. Stripper arms are provided above the dies to keep the metal strip from being lifted with the punches.



Piercing Die that is Adjustable to Permit Punching Any Number of Holes up to Twenty-six in Metal Strips

The die set illustrated is designed to accommodate as many as twenty-six punches and dies. Holes from 1/16 to 1/4 inch diameter can be punched. The minimum center-to-center distance between the holes is 5/8 inch.

* * *

Meeting of American Society for Testing Materials

As MACHINERY goes to press, the thirty-ninth annual meeting of the American Society for Testing Materials is being held at Atlantic City, the meeting being scheduled from June 29 to July 3. Among the subjects receiving attention may be mentioned the symposium on radiography and X-ray diffraction, influence of the time element in the annealing of carbon steel, high velocity tension impact tests, damage and over-stress due to the fatigue of ferrous materials, forming properties of non-ferrous sheet metals, and stress-relief annealing of high-strength Monel metal plate. Copies of papers presented may be obtained from the Society, 260 South Broad St., Philadelphia, Pa.

Engineering News Flashes

The World Over

"Bullet-Proof" Electric Shovel Cab

When an electric-shovel operator must be surrounded by armor plate to enable him to do his day's work, that is news. The Harnischfeger Corporation, of Milwaukee, recently built an electric shovel for the Chile Exploration Co., to be used in South America in an open-pit copper mine. Because frequent blasting is necessary, the machine is equipped with armor plates surrounding the operator's cab, to permit it to stay within close range and yet withstand the heavy rain of stones. The rear and side walls of the cab are 1/2 inch thick and the top 3/8 inch thick. To eliminate loss of time in frequently moving the machine out of range at the time of blasting, it merely, so to speak, turns its back when a blast is made. All exposed parts are adequately protected against flying stones.

Magnesium Produced from Sea Water

Unlimited supplies of magnesium may be available to industry through the new methods for producing the mineral from sea water developed at South San Francisco, Calif. In a report to the American Chemical Society, M. Henry Chesny, of the Marine Chemicals Co., Ltd., says: "There can be little doubt that the ultimate source of magnesium compounds for large-scale consumption will be their production from sea water." The commercial recovery of minerals from sea water is now proceeding both on the east and west coasts of the United States. In addition to the successful production of magnesium from sea water on the west coast, bromine for anti-knock gasoline is being extracted on the coast of North Carolina by the Ethyl-Dow Chemical Co.

Reducing the Weight of Diesel Engines

What is considered an important forward step in Diesel engine construction has recently been taken in England, where a new engine built to replace another power unit in a motor ship doubled the power output without requiring more space than the original unit. The new engine is rated at 4000 brake-horsepower at 109 revolutions per minute, but in tests, actually developed 4400 brake-horsepower. It was built by Richardsons, Westgarth & Co. for the motor ship Silverlarch of the Silver Line.

The reason that the weight and size of the engine could be reduced as much as stated was that steel and electric arc welding were employed in its design. The major parts of the engine, such as the bedplate and columns, and the crankcase covers and plates, are all built of arc-welded steel plate, using Lincoln Electric Co.'s equipment. This enabled a structure to be produced of greater capacity for the same weight and size than was possible with the former cast-iron construction. The bedplate weighs 33 per cent less than a similar cast-iron bedplate. The actual weight of the arc-welded bedplate is 29 1/2 tons, while the weight in cast iron was 44 tons. Cost savings are also claimed through the elimination of patterns and simplified machining.

Silent Switch with No Moving Parts to Wear Out

A small, compact electric switch, which is completely silent in operation and has no moving parts to wear out, has been developed by the General Electric Co. About the size of a marble, the new switch utilizes the mercury-break principle to function without the suggestion of a click. In the laboratory at Schenectady, one of the mercury switches has turned a 200-watt incandescent lamp on and off some sixty-five million times in the last two years without failing or wearing out.

The switch consists of two shallow chrome-steel cups about 3/4 inch in diameter, sealed together with a strip of lead glass to form a hollow compartment. Separating the cups is a disk of ceramic material in which there is a small hole near the edge. The compartment is evacuated after fabrication, and in it about four grams of mercury are inserted. The mercury fills, roughly, one-quarter of the space. After insertion of the mercury, the compartment is filled with hydrogen at about atmospheric pressure and sealed off by welding.

In the "off" position, the hole in the ceramic insulating disk is above the line of the enclosed mercury. However, when rotated 20 degrees, the switch assumes a position where the mercury can flow through the hole, thus establishing a contact between the two chrome-steel cups and closing the

circuit. Hydrogen is used in the switch because of its properties as a cooling agent and because in it an arc can be better quenched.

An additional feature of the switch is a tiny plate of steel with two-tenths of a mil of platinum superimposed on its surface. One such plate is welded to the inside of each steel cup, affording better mercury-to-metal contact and keeping the switch from heating. As a final operation in its manufacture, the switch is cadmium-plated to give a good surface for external contact. It is then ready to be fitted into a suitable enclosing case or to be incorporated into any switching equipment.

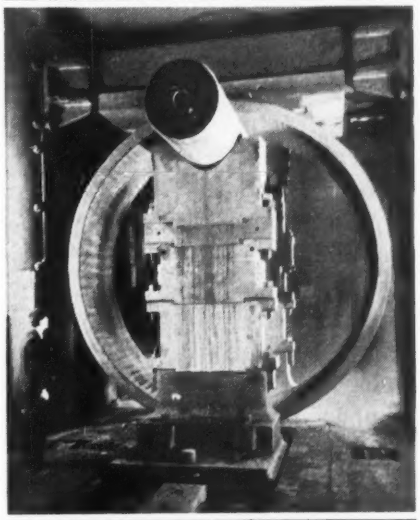
Thin Stainless Steel Coatings on Ordinary Steel

A new type of stainless steel coating is reported to have been developed by F. F. Gordon, of Sheffield, England, a research engineer who is also a director in a Sheffield steel works. Mr. Gordon has spent several years of research on the problem of bonding a very thin coating of stainless steel to ordinary steel. It is stated that sheets of ordinary steel can, by the new process, be given a stainless steel coating of less than 0.001 inch thick. This apparently opens up new possibilities for making steel surfaces rustless without the need for using a fairly thick layer of stainless steel—a method that is now being used to some extent.

Largest Gear-Rim Forging Ever Made in Great Britain

The accompanying illustration shows a forging for a gear 13 feet 9 inches in diameter, the width of the finished gear being 21 inches. The gear has 769 teeth and is to be used for a single-reduction geared marine turbine constructed by Cammell Laird & Co., Ltd., Birkenhead, England. In making the forging, the portion of the ingot required for the rim, after being trepanned with a 24-inch hole, was expanded under a hydraulic forging press to slightly over 10 feet in diameter; then it was reheated and forged to about 14 feet in diameter. There was a machining allowance of 1 inch on all surfaces.

The expertness in forging will be appreciated when it is considered that all the measurements had to be taken while the forging was hot, making allowance for contraction of the forging as it cooled. As a matter of fact, the forging was 1 3/4 inches larger on the internal diameter when finish-forged than it was after cooling. A very large press was obviously required for this work, as it could be produced only on a press having "daylight" between the forging tools of at least 15 feet. The work was done at the Vickers Works of the English Steel Corporation on a 7000-ton electro-hydraulic forging press.



A 14-foot Diameter Forging for a Marine Turbine Gear

A 10,000,000 Cubic Foot Gas-Holder

What is said to be the world's largest welded gas-holder is being constructed by the Stacey Bros. Gas Construction Co., of Cincinnati, Ohio, for the Ford Motor Co. at Detroit, Mich. The gas-holder will have a capacity of 10,000,000 cubic feet. It will be 220 feet in diameter and 344 feet high—equal in height to a thirty-story building. The construction involves the use of welded rather than riveted plates, which is an innovation in this type of construction. It will require 3000 tons of structural steel, 25 tons of welding rod, and 200 tons of miscellaneous materials.

We Believe We Prefer Wool

According to *Industrial Britain*, among the Sheffield exhibits at the last British Industries Fair there was a piece of cloth suitable for men's clothing, in herringbone pattern, entirely woven from Staybrite steel filament less than 0.00025 inch in diameter. As an engineering achievement, this is certainly interesting; but it hardly seems attractive for cold weather clothing.

A 700-Foot Antenna Tower

A new antenna tower for the Westinghouse Electric & Mfg. Co.'s broadcasting station KDKA is just being constructed. It consists of a slender steel mast which is held erect by two sets of guys. It is triangular in cross-section and although each side at the bottom is only 5 1/2 feet, it rises to a height of 710 feet. The entire weight of the tower is 60 tons. It is said to be the first tower of its kind to be erected for broadcasting service, although smaller similar antennae have been used for many years for short-wave stations. A powerful red-beam aviation beacon will be mounted on top of the antenna, which will be visible for many miles and will serve as a warning to airplanes.

EDITORIAL COMMENT

Is there a Place for the Young Engineering Graduate?

Is the engineering profession overcrowded? Just at this time of the year a great many young men, who have just graduated from our engineering colleges, will ask themselves this question. If we think of the engineer merely as a designer of machinery and equipment, perhaps there is some foundation for the statement that the profession is overcrowded; but when we think of engineering in its broader aspects, there is not.

An engineering education is an excellent foundation for almost any activity in industry. It is a good background for industrial cost accounting and executive accounting work. It forms an equally good background for sales promotion work in the machinery and general engineering field. Men with an engineering education are well fitted to become good engineering salesmen and service engineers.

The important thing for the young engineering graduate to keep in mind is that he is not a finished product. The engineering education obtained at school cannot, and is not intended to, turn out a full-fledged engineer. It is, however, expected to so equip the young man that he can start effectively to learn how to fill a real engineering job in a specific branch of the industry. Whether that job is one in designing engineering, plant or production engineering, or in the management branch of the industrial field makes little difference. An engineering training is useful in any case. The work in the industry that the engineering graduate chooses will depend upon his special inclination and fitness for any particular activity.

Methods of Taxation Can Make or Break Industry

Methods of taxation can make or break industries; they can make or unmake prosperity. By the right methods of taxation, industry can be encouraged, wages raised, and the comfort and standard of living of the nation assured; by the wrong methods, enterprise may be discouraged, unemployment increased, and general well-being sacrificed.

Just as there are honest and dishonest business methods, so there are honest and dishonest methods of taxation. No principles vital to business are so little understood throughout industry as those concerned with taxation; but one principle ought to be clear to all: Government—federal, state, and municipal—can collect taxes honestly from business and from the individual only to the extent to which it renders an equivalent service to the business or individual. Nor may the Government spend any more than it honestly collects. Certainly, the Government has no right to collect by force the earnings of the labor of one individual for the benefit of another.

Increased Employment Caused by Improved Machinery

The electrical machinery and supply industry and seventeen other machine-created industries that have come into existence since 1879, gave employment, fifty years after that date, to 1,125,000 workers, according to information given in a book "Machinery, Employment, and Purchasing Power," published by the National Industrial Conference Board, with the assistance and collaboration of the National Machine Tool Builders' Association. This figure, however, does not measure the total contribution of science, invention, and machinery to increased employment. It covers only the field of manufacturing and only some of the important activities within that field. It does not indicate the number of new jobs created in such important fields as public utilities, various transportation and distribution industries, etc. In fact, the automobile industry alone is primarily the cause of the employment of 4,000,000 people at the present time.

All manufacturing industries in 1879 employed about 50,000 wage earners for every million inhabitants in the United States. Fifty years later they employed close to 73,000 wage earners for every million inhabitants, an increase of almost 50 per cent. Since it is during this period that machinery has played an ever increasing part in industry, it is hard to reconcile with these facts the statement so often made by people unacquainted with the true state of affairs that the use of improved machinery has caused unemployment. Instead, it has created jobs for a great many more people than were formerly employed by industry.

Ingenious Mechanical Movements

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and Other Devices

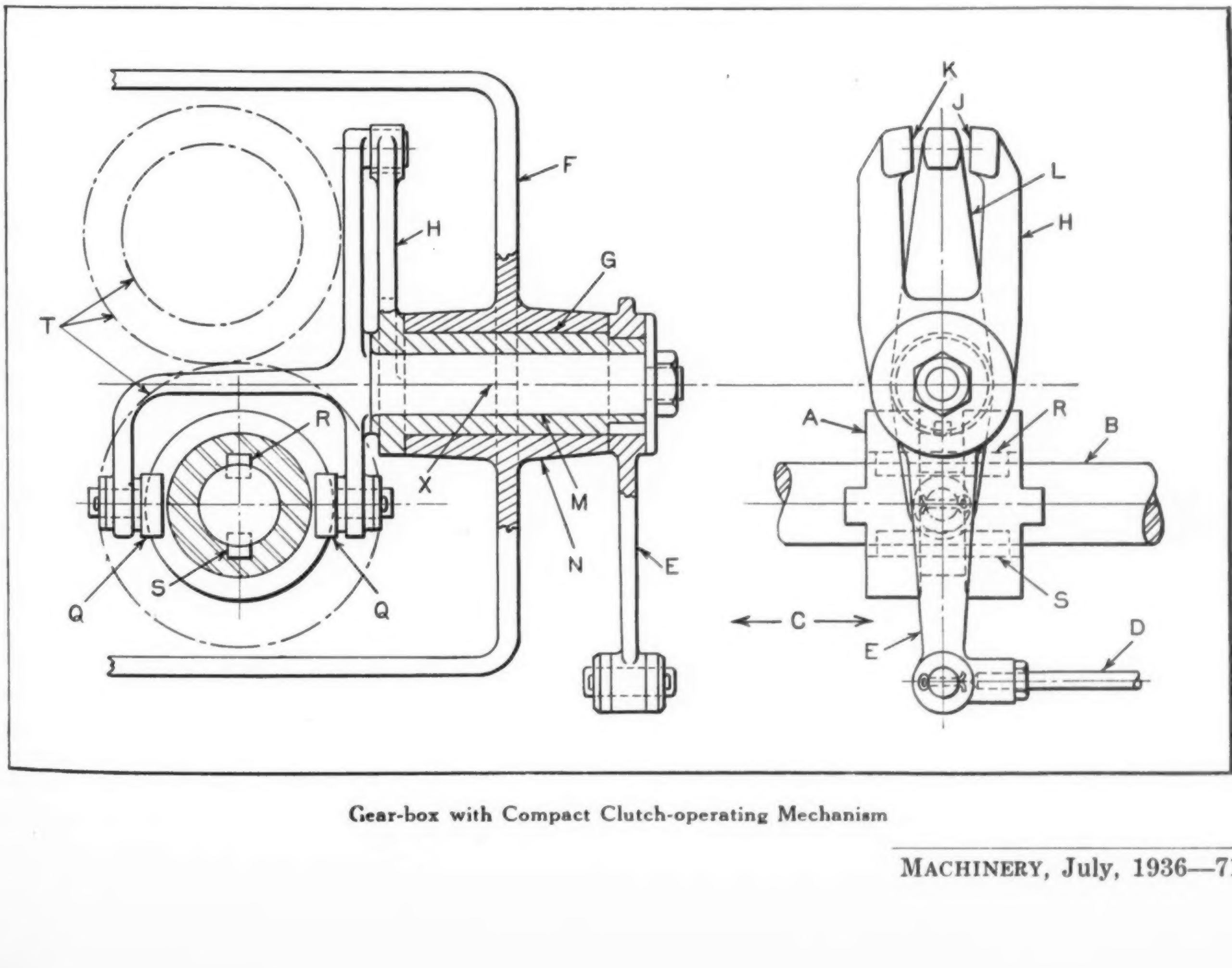
Compact Clutch-Operating Mechanism for Gear-Box

By F. H. MAYOH

The mechanism shown in the accompanying illustration is used to operate a clutch inside of a gear-box by means of an outside lever. The principal requirements of the mechanism are that it be simple and compact. The clutch sleeve is of the tongue-and-groove type shown at *A*. The sleeve slides on a shaft *B*, engaging two slotted disks attached to a train of gears (not shown) that turn the output shaft in either the forward or reverse direction, depending on whether the sleeve is shifted to the right or to the left, as indicated by the arrows at *C*.

A trip operated from a traversing table through the medium of a connecting-rod *D* and a lever at *E* on the outside of the gear-box *F* transmits the shifting movement to sleeve *A*. Lever *E* is keyed to a sleeve *G*, which is an integral part of the lever *H*. As lever *E* is rocked back and forth to actuate the clutch, lever *H* will also be rocked to the right or left until pad *J* or *K* engages the end of the clutch-shifting fork *L*. This shifting fork is made with a stem at *M* which leaves it free to swivel inside of sleeve *G*, the entire arrangement being held in place within the boss *N* of the gear-box by means of a nut and washer.

Two bronze shoes *Q*, which fit in a groove in the clutch sleeve *A*, provide means for operating the clutch. Sleeve *A* is also keyed to shaft *B* at *R* and *S*. The three gears indicated by dot-and-dash lines at *T* form part of the driving gear train. The compact construction of the mechanism is secured by having the operating levers rotate or pivot on the center line *X*. The clearance between the pads *K* and *J* and the shifting fork *L* allows the tripping mechanism to carry over the dead center.



Gear-box with Compact Clutch-operating Mechanism

Combination Cam and Parallel Motion for Guiding Spindle in Square Path

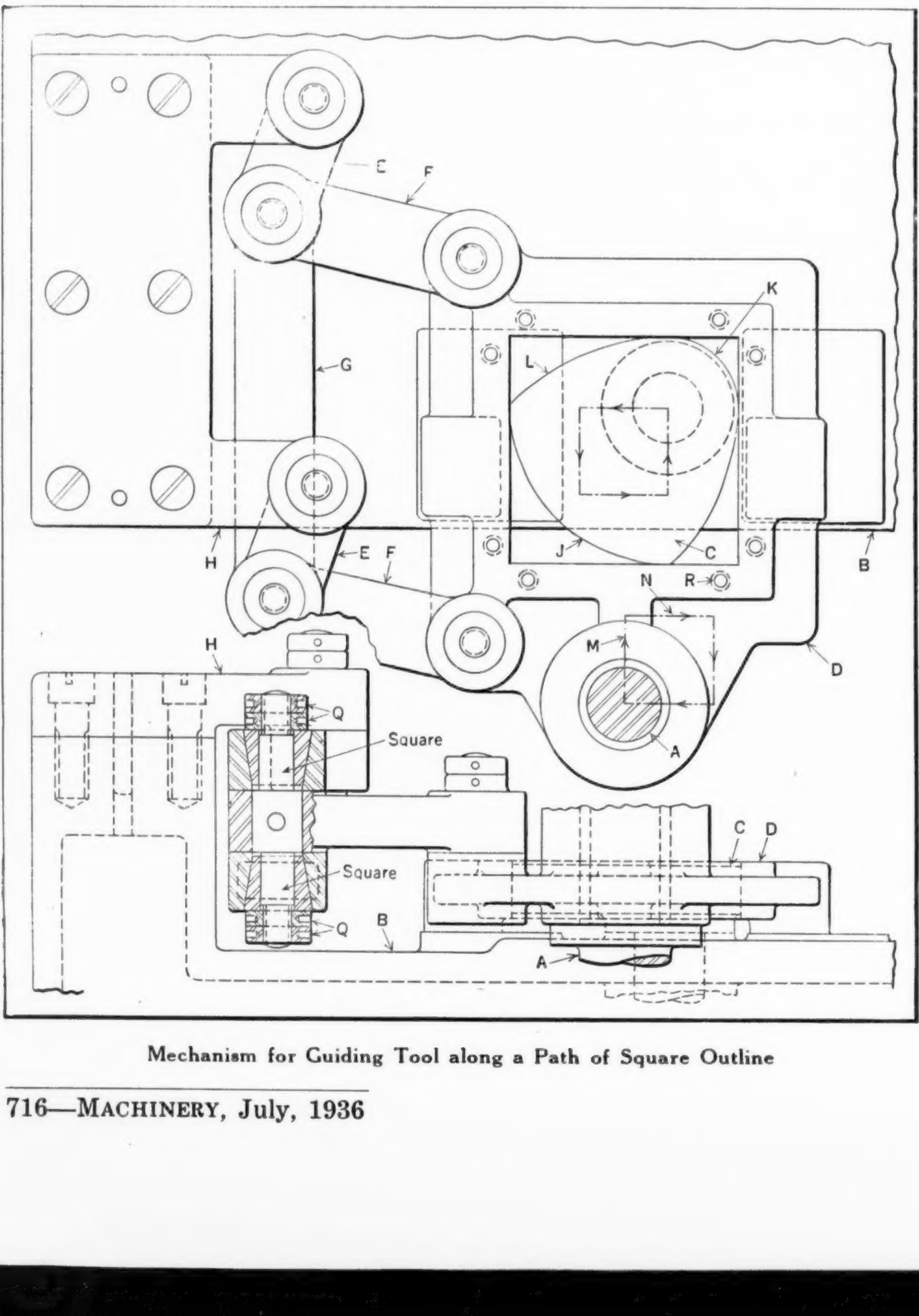
By J. E. FENNO

The mechanism shown in the accompanying illustration was designed to guide the center of the spindle *A* along a square pathway indicated by lines *M* and *N*. It is used in conjunction with a woodworking machine for gouging out an endless grooved recess of square contour into which a decorative insert is fitted. The movement involves two separate motions—a cam motion and a parallel motion. The former is the actuating member which imparts the movement to the follower, while the latter serves merely to maintain the direction of motion of the follower. By the use of interchangeable cams and follower plates, as explained later, the follower can be made to follow paths of various dimensions.

The mechanism is mounted on the machine frame *B*, and consists chiefly of cam *C*, follower *D* which carries the cutter-spindle *A*, and the parallel motion links *E*, *F*, and *G*. The follower is connected to the stationary bracket *H* through these links. It is evident that, with this arrangement, the angular position of the follower will remain unchanged, regardless of its location relative to the cam. The cam is of the triangular type, imparting movement in the four directions required.

From the position shown the cam is rotated in a clockwise direction. Since edges *J* and *K* are concentric with the camshaft, continued rotation of the cam will not impart a horizontal movement to the follower; but the upper edge *L* of the cam will raise the follower so that the center of the spindle will move along a path coinciding with the line *M*. When the curved edge *J* becomes tangent to the top cam surface of the follower, the center of the spindle will coincide with the top end of line *M* and the vertical movement of the follower will cease. Edge *L* will now force the follower toward the right so that the spindle center will follow a path coinciding with line *N*.

The action of the cam and follower is the same for each side of the square over which the spindle center passes. This cam is of the positive type, since the distance between the two points at which the edges of the cam intersect a line passing through the center of the camshaft is the same, regardless of the angularity of the line.



Mechanism for Guiding Tool along a Path of Square Outline

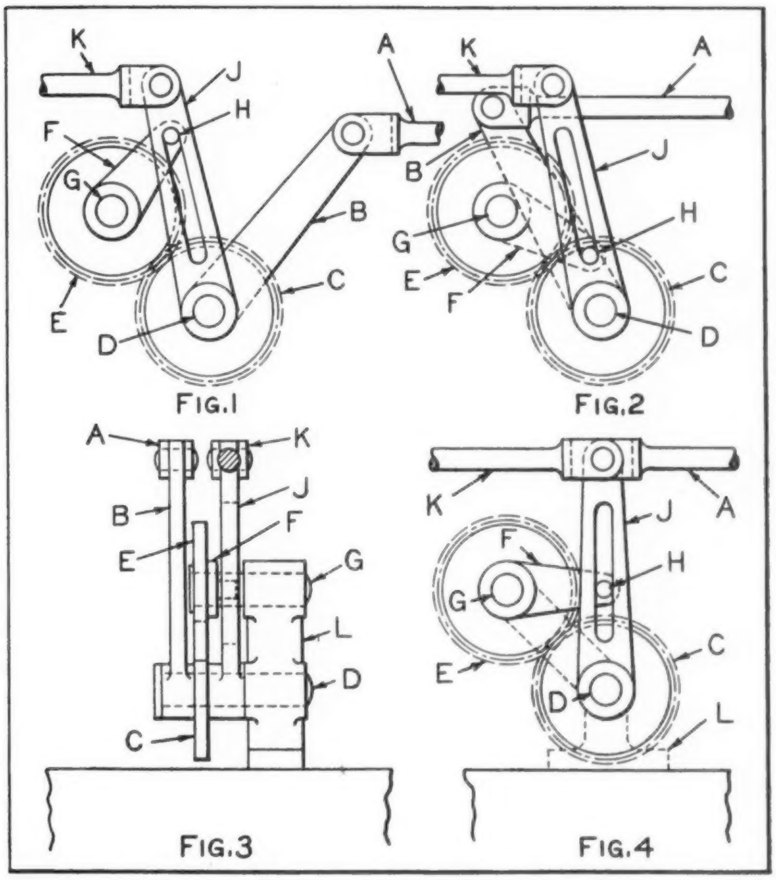
If the spindle is required to follow a square path of smaller dimensions, the cam surfaces of the follower are lined by means of four flanged plates, and a cam giving the required throw is substituted for the one shown. The camplate can be quickly attached by means of screws which pass through the plate flanges into tapped holes *R*.

Owing to the movement of the spindle in a plane normal to its axis, the upper end of the spindle is provided with two universal joints and a sliding sleeve. This provides a flexible connection with the upper driving shaft of the machine. Since, however, this arrangement is a common one, it is not shown. The follower is supported in its overhanging position from the bracket *H* by two pads integral with the follower, which rest on finished pads cast on the machine frame. In order to compensate for wear in the lever and link connections,

the connection pins were designed as shown in the cross-section. With this arrangement, any wear can be taken up by tightening the check-nuts Q.

Obtaining Two Reciprocating Motions from One Movement

By L. KASPER



Diagrams Illustrating Operation of Reciprocating Mechanism

A change in a wire product necessitated changing the mechanism of a wire-forming machine so that the reciprocating motion originally used would be replaced by two similar movements of lesser magnitude in the same period of time. The accompanying illustration shows how this was accomplished, using the same source of power. Originally the required reciprocating movement was furnished by rod A. In the new arrangement, this rod actuates rod K, causing it to move forward and back while rod A moves in one direction only.

Rod A is given a reciprocating motion from a distant source of power for transmitting the oscillating motion to the lever B, which is fastened to gear C. Gear C and lever B are free on stud D, and oscillate in unison. Gear C transmits motion to gear E, which carries the lever F, both of which are free on stud G. Lever F carries the pin H, which travels in a slot in lever J, transmitting motion to rod K. The assembly is supported by the bearing L, shown in Figs. 3 and 4 but omitted in the other two views.

In Fig. 1, rod A is shown at its extreme right position, while in Fig. 2, it is at its extreme left position, representing half its cycle of operation. It will be noted that in both these views, lever J occupies the same position, having passed through one complete cycle and returned to its original position.

Starting its movement from the position shown in Fig. 1, lever B is moved to the left by rod A, causing gear C to make a partial revolution. Gear E, meshing with gear C, is thus given a partial revolution in the opposite direction. As lever F is fastened to gear E and moves with it, pin H is moved downward in the slot in lever J, causing the latter to move to the right until pin H reaches the horizontal center line of stud G, at which time lever J is at its extreme right-hand position, as shown in Fig. 4.

Continued movement of rod A produces a further downward movement of pin H. As pin H passes the center line, it acts against lever J in the reverse direction, moving it to the left. As rod A reaches its extreme left position, lever J is also at its extreme left position, having completed its cycle, whereas rod A has completed but half its cycle. As rod A returns to its extreme right position, lever J again passes through its cycle. The magnitude of the movement of lever B may be determined by comparing its positions in Figs. 1 and 2, while the movement of lever J will be understood by reference to Figs. 1 and 4. Fig. 3 is an end view of the complete assembly.

* * *

Lubricating Under-Feed Waste-Packed Bearings

In an item published in *Oil-Ways*, A. C. Forman, of the Standard Oil Co. of N. J., states that under-feed waste-packed bearings using wool yarn or horsehair are best lubricated by packing the material rather tightly into the bearing box with the fingers. Some bearing boxes may require the use of a clean, pointed stick to insure tightness of packing in corners and crevices. A sufficient space (about 1/2 to 1 inch) should be allowed above the packing to permit the addition of replenishing oil without causing slopping or overflowing. If grease is used to replenish the waste, the surface waste that has been in contact with the bearing is usually discarded, because it has become hard and glazed. The remainder should be pulled from the box and mixed carefully with the new grease.

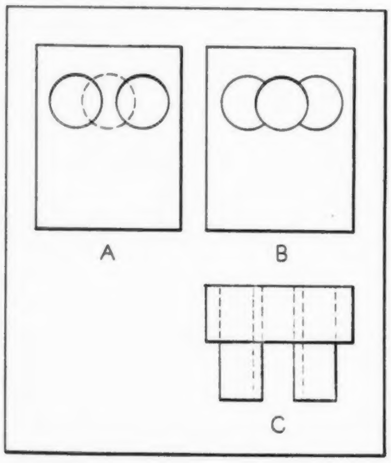
Ideas for the Shop and Drafting-Room

Time- and Labor-Saving Devices and Methods that Have been Found Useful by Men Engaged in Machine Design and Shop Work

Jig for Drilling Elongated Holes

The jig shown in the accompanying illustration is used in drilling one of three holes in a high-carbon, high-chromium steel plate 1/2 inch thick previous to broaching an elongated hole. As the elongated hole is required to be accurate and smoothly finished, it is necessary to leave as little scrap stock as possible for the broaching operation. The radius at each end of the elongated hole is 0.039 inch, and the center distance 0.109 inch. The radius dimension is easily provided for by drilling two 0.078-inch holes 0.109 inch from center to center. In order to drill out the scrap stock left between the two holes, it is necessary to have an accurate guide for the drill, because the small amount of scrap material to be removed allows the drill to cut into the two end holes, as indicated by the dotted circle shown in view *A*.

In making the drill jig, two 0.078-inch holes were drilled in a block of tool steel, 1/2 inch thick, and then plugged with drill rod pins. The drilled holes were located accurately with a center-to-center spacing of 0.109 inch. The block was next surface-ground, after which a 0.078-inch hole was carefully laid out and drilled half way between the two pins. The pins were then removed and hardened while the block was shaped down to a thickness of 1/4 inch and hardened.



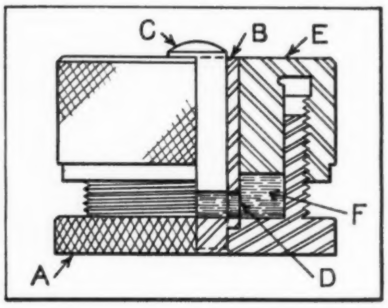
Jig for Drilling out Stock between Two Holes

The pins were next replaced in the same positions in which they were drilled. Since the block was reduced to a thickness of 1/4 inch, the two pins extended through the block for a distance of 1/4 inch, as shown at *C*. The ends of the pins projecting from the drill jig were inserted in the two end holes drilled in the work. The central hole then served to guide the drill, which removed most of the material between the two holes drilled in the work. The small amount of metal left for broaching made it possible to produce accurate holes of uniform size.

New York City — ARTHUR SIGNORETTI

Hydraulic Work-Supporting Jack

A supporting jack of low height, such as shown in the accompanying illustration, which requires a small adjustment of the actuating member *E* to obtain a larger movement of the work-supporting part *C* can often be used to advantage. A higher degree of sensitivity is obtained in the adjustment of a support of this kind than is possible with the regular type of jack.



Hydraulic Jack for Supporting Work

The hydraulically operated jack illustrated has a sleeve stud *B* riveted to the knurled base *A*. This stud is a close sliding fit on the plunger *C* and has a port or hole *D* drilled through its wall as indicated. The adjusting nut *E* is also made a close fit in the bore of base *A*, while the internal thread is made a free fit on the outside thread of the base. The close fits referred to are necessary to insure proper hydraulic action. When the knurled nut *E* is screwed downward, the liquid *F* is forced through the port *D*, causing the plunger *C* to rise.

New York City — J. A. HONEGGER

* * *

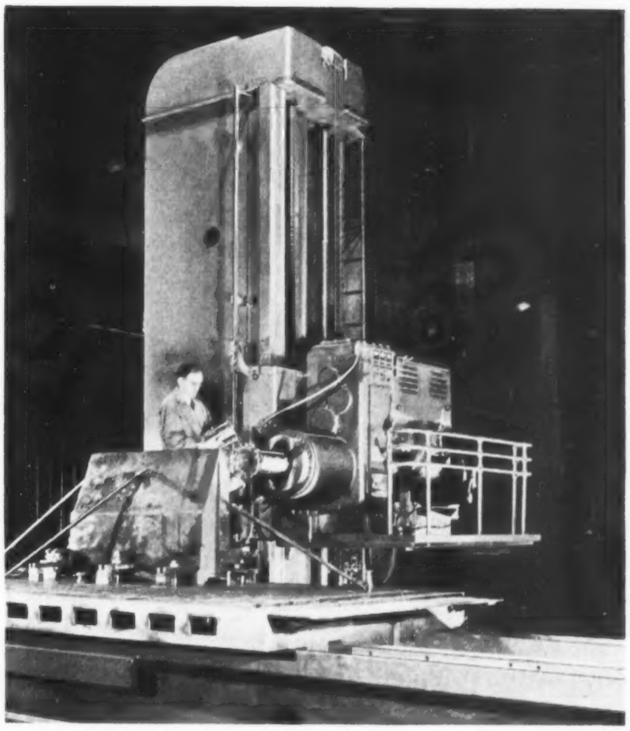
Truck Production Reaches Record Height

The production of motor trucks reached approximately 500,000 units during the first half of the year, which is considerably in excess of any other six-month period. The production of cars and trucks for the first six months exceeded 2,575,000 units, which is a record figure for this period, with the exception of 1929.

Custom-Built Machines Can be Tailored to Fit the Work

When Machines are Built to Meet the Requirements of the Individual Shop, Work can be Assigned to them without Questioning whether the Job can be Done

By J. R. JOHNSON, Director of Engineering
The Ingersoll Milling Machine Co., Rockford, Ill.



MACHINE tools may be more or less of standard type and still be built to meet the needs of the individual shop. The production of such "custom built" or "tailor made" machine tools is the business of The Ingersoll Milling Machine Co., Rockford, Ill. Individually designed machines are built by this concern both for handling a large variety of work and for single-purpose applications. Machines of the latter type are so constructed, whenever possible, that they can be easily altered to suit changes in the product.

When a prospective customer considers the purchase of a machine, the engineers of the company make a survey of the shop for which the machine is intended in order to determine its peculiar needs. The machine is then designed as far as possible to meet present and future requirements. Special features that solve the production problems of the individual shop can be readily supplied on machines when they are custom built.

Two Tables Provide Unusual Flexibility for Handling a Wide Range of Work

A concrete illustration of this principle is presented by Fig. 1. The table type milling, drilling, and boring machine there shown resembles, in a general way, a standard type of machine tool. It possesses the distinctive feature, however, of having two separate tables and beds. The bed for the main table is fastened to the floor, while the bed for the narrow auxiliary table may be located in various positions along heavy rails extending at right angles to the main bed.

With this double table arrangement, the machine is adapted for handling work much wider than could be accommodated on the ordinary standard machine of the same weight. On the other hand, if a long run of work is to be handled that can be carried by the main table alone, the auxiliary table and bed can be entirely removed from the machine or else placed in their outermost position and the outer boring-bar column located between the two tables, close to the work. The outer boring-bar column slides on ways extending at right angles to the main bed in line with the main column.

When the machine is set up as shown, the two tables move in synchronism to feed the work back and forth past the milling cutters. Similarly, when the tool-head is moved up or down on its column the outer boring-bar support moves with it. The main table is 60 inches wide, and the auxiliary table 36 inches wide. With the auxiliary table in its outermost working position the maximum distance across the two tables is 138 inches.

This machine combines the operating advantages of a light machine with the capacity of a much larger one, thus providing a flexibility that is not often found in a standard machine. It is unusually convenient for a shop that has not sufficient large work to keep a heavier machine busy.

Fig. 2 shows a machine that is similar, except that it is provided with a single table which limits the size of work that can be handled. The photograph was taken from the rear to emphasize the strikingly modernistic appearance that is being featured in Ingersoll machines today. This machine was also designed to meet specific requirements, but it can be considered more or less standard.

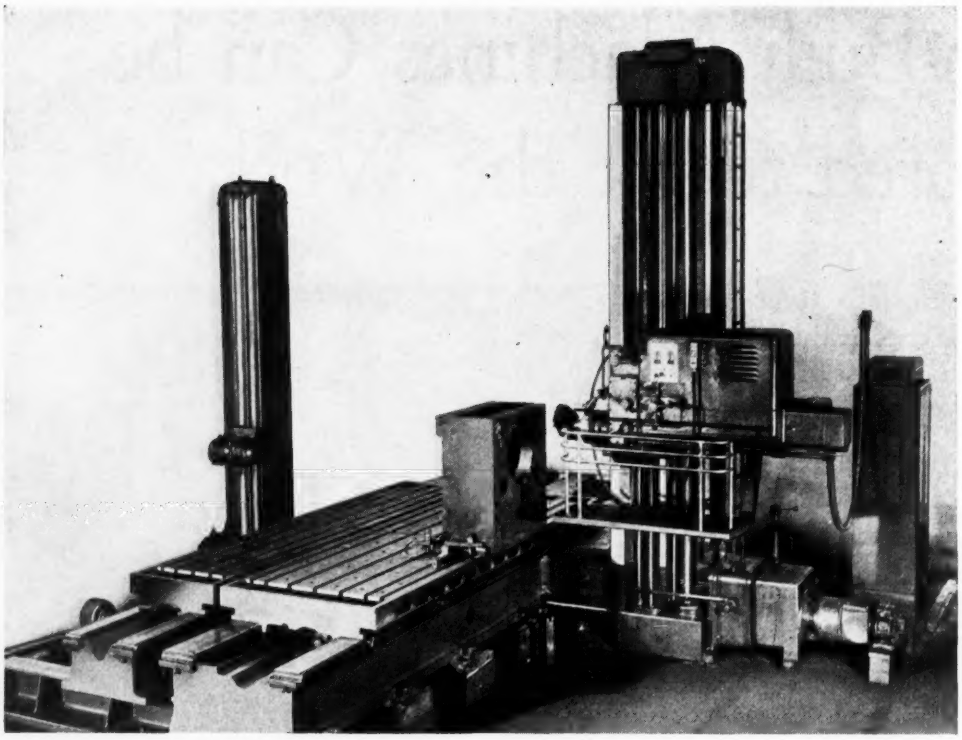


Fig. 1. Ingersoll Machine Provided with an Extra Table that May be Used in Handling Wide Work

The machine shown in the heading illustration was designed for milling, boring, drilling, and similar operations on the large dies used in producing automobile bodies. One of its special features is that the head can be moved horizontally across the face of the column, as well as vertically. Thus the head can be extended from the column to support cutters close to the work when surfaces are to be machined at some distance from the side of the column. The machine has an unusual milling capacity, because of the fact that after the head has been extended the full amount, the spindle can be extended still further. Milling cutters mounted on the nose of the spindle can be used at a maximum distance of 67 inches from the inner side of the column.

This machine is fitted with a table 16 feet long by 7 feet wide, and the maximum distance from the top of the table to the center line of the spindle is 10 feet. These dimensions provide for handling the largest body dies made at the present time. The machine weighs approximately 145,000 pounds.

Pendent Controls Provide Maximum Operating Convenience

Pendent controls have proved a boon to the operators of large machines, as they permit the man to stand where he can best observe the operation and yet instantly control the machine movements. The operator can even ride back and forth on the table or on large work and hold the pendent control in one hand for instant use. Patented pendent controls of various types have been provided to facilitate the operation of Ingersoll machines.

The pendent control shown in Fig. 3 was the only means provided for controlling the movement of a huge machine that weighs 75 tons. At the top of this pendent control are six buttons for starting and stopping the spindle motor, for increasing or decreasing its speed, and for feeding the spindle in or out. The "Faster" and "Slower" buttons are connected with a rheostat, and thus increase or decrease the motor speed when they are depressed. When either of these buttons is released, the spindle immediately starts to rotate at the speed for which its gear-box has been set.

Below the spindle buttons are a series of eight buttons and a toggle switch which control the operation of both the head and table. The drive is normally connected to the table, and when the operator wishes to move the head, he must first move a lever on the machine. It will be observed that there are buttons for starting and stopping the motor that provides this drive and also for increasing and decreasing its speed through a rheostat. Another button provides a fast feed for bringing the work up to the cutter or vice versa, and there is a button that provides a rapid traverse for withdrawing the work from the cutter or the cutter from the work.

The "Jog" button permits of "inching" the table or the head. When the rheostat arm has been shifted to its maximum position, it is returned to its normal position by depressing the "Reset" button. The toggle switch is pushed upward, as shown, for normal operation of the table or head, and pushed downward when the motor is to be revolved in the reverse direction.

Below these buttons is a cross-bar marked "Stop" which serves to stop the entire machine instantly when it is depressed. Of the four toggle switches beneath this stop-bar, the left-hand one controls the coolant-pump motor. The next controls the direction of spindle rotation, that is, right- or left-hand. When the third toggle switch is pushed upward, the machine is set for a higher rate of traverse than when it is pushed down, this switch controlling a two-speed motor.

The fourth of these toggle switches is used in conjunction with the electrical tachometer incorporated in the lower end of the pendent housing. The dial of this instrument has a scale with two

sets of figures. The upper set, which reads from 1 to 180, represents "revolutions per minute," while the lower set, which reads from 1 to 36, represents "inches per minute." When the right-hand toggle switch is thrown upward as shown, the tachometer will indicate the speed of the spindle, in revolutions per minute, while the feed of the head or table, in inches per minute, is indicated when the toggle switch is pushed downward.

If the speed or feed is low so that the exact figure is hard to determine from the scale, the operator can obtain a figure ten times the actual amount by merely depressing the small button that is below the fourth toggle switch. Then he simply divides the reading by 10.

One of the important advantages of this tachometer is that it provides a means of easily determining the most efficient speeds and feeds for various jobs. The operator can gradually increase the feed and speed in starting a new job by merely depressing buttons on the pendent housing until the most efficient combination is obtained, as indicated by the sound of the cutters and by the finish obtained on the work. After observing the tachometer readings, he can set the feed- and speed-boxes to make the machine operate at the most efficient feed and speed.

Electrical Controls that are Both Portable and Stationary

Combined stationary and portable controls can be provided, as shown in Fig. 4, in which case a complete control is built into the spindle head for the convenience of the operator as he stands on a bridge attached to the front of the head. Should it be desirable for him to stand on the floor or on the table to observe the operation, he can carry the pendent control *A* with him and control the movements of the spindle, head, and table by means of its buttons and toggle switches. He must, however, first swing switch *B* into the "Portable" setting as shown. When the operator again desires to run the machine from the main electrical control, he must turn this switch back to "Stationary."

The electrical control in the head is provided with three tachometers, one each for the table, head, and spindle. These tachometers are used in a similar manner to that incorporated in the pendent control shown in Fig. 3. An electrical control of simplified type is illustrated in Fig. 5. In this case, the buttons of the pendent control are not duplicated on the stationary control, the pendent buttons always being used for controlling the operation of the machine, whether the pendent housing is supported on the spindle head, as shown, or carried in the hand of the operator.

An important difference between this control and those already described is that the rheostat changes are made by revolving cylindrical dials. The one at the left indicates the speed of the spindle, and the one at the right the feed of the table or spindle head. It is customary to graduate these dials in the shop in which the machine is installed, so as to suit the voltage conditions where the machine is to be used.

Below the dials is a rectangular red glass, behind which a bulb lights when the lubricant pump is started. This indicates whether the various moving parts of the machine are being adequately lubricated. The buttons below this glass are for starting and stopping the generator and the coolant pump and for controlling the direction of spindle rotation.

Tubular Ways and the Johnson Drive are Patented Features of Ingersoll Machines

Tubular ways that insure constant lubrication of the table and bed contact surfaces are a patented feature of Ingersoll machines that differs radically from conventional machine tool design. Long accurately finished tubes, fastened to each side of the

Fig. 2. Machine Tools can be Modern in Appearance, as well as in Mechanical Details

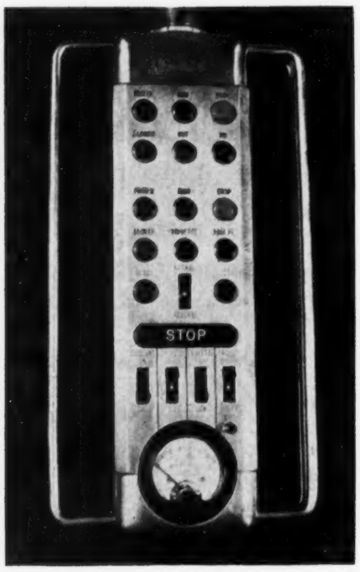


Fig. 3. Pendent Control which Completely Governs all Movements of a Huge Milling Machine

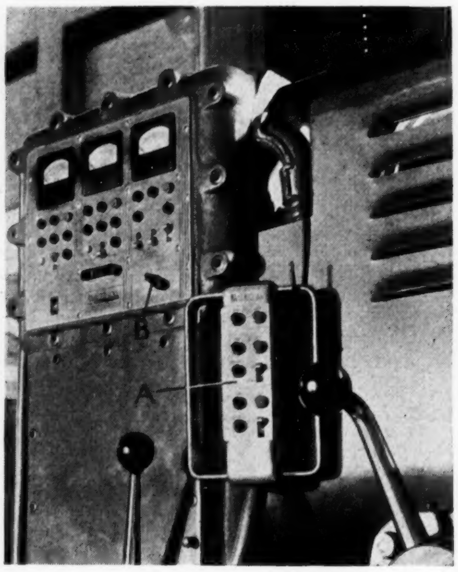


Fig. 4. An Arrangement that Provides Complete Control from a Panel Mounted on the Spindle Head, and Partial Control from a Portable Pendent

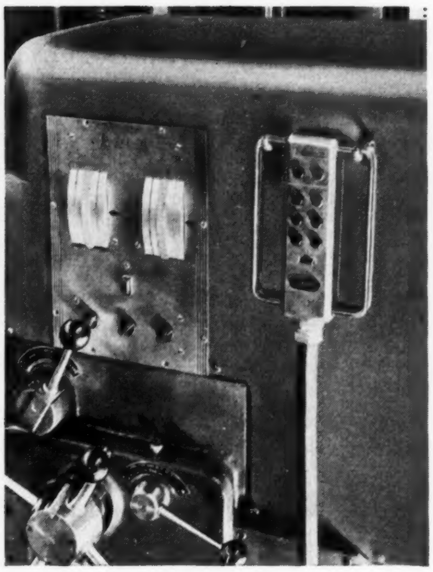


Fig. 5. Simplified All-electrical Control with a Pendent Housing which Can be Used Either as Portable or Stationary Equipment

bed as shown in Fig. 6, slide in semicircular ways on the bed. These tubes serve as reservoirs for oil that is pumped in at one end and forced out at holes provided at intervals along the tubes. It is claimed that oil is supplied so efficiently by this method that there is never a metal-to-metal contact between the tubes and the bed ways. The tubes are hardened and ground, thus obviating the necessity of using hardened and ground steel ways on the bed. This tubular-way construction is covered by patents.

Another development that is of outstanding interest is the unusual method employed for driving the long tables of Ingersoll machines, as will be apparent from Fig. 7. Instead of the conventional lead-screw, use is made of a comparatively short combined worm and helical gear. Worm threads are cut around this member in the ordinary manner to engage a suitable rack that extends the full length of the table. Then helical teeth are cut across the worm threads so that the combined helical gear and worm can be driven direct by a helical gear located in the bed. Thus, the worm is used both as a driving and a driven member, saving a pair of gears and shafting. This patented "Johnson Drive," as it is called, feeds the table back and forth with an unusually smooth action.

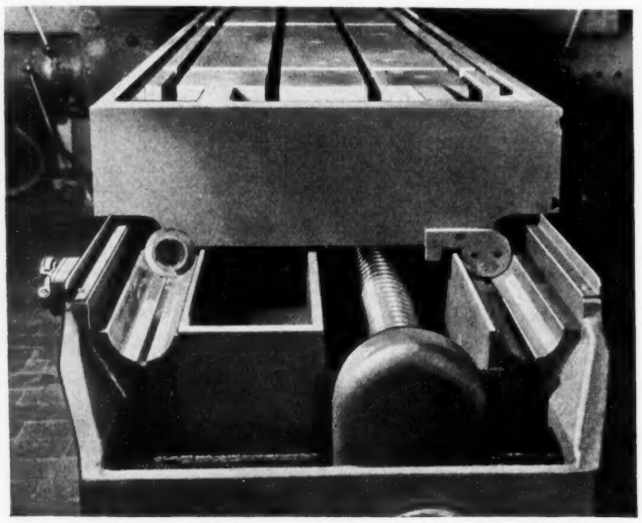
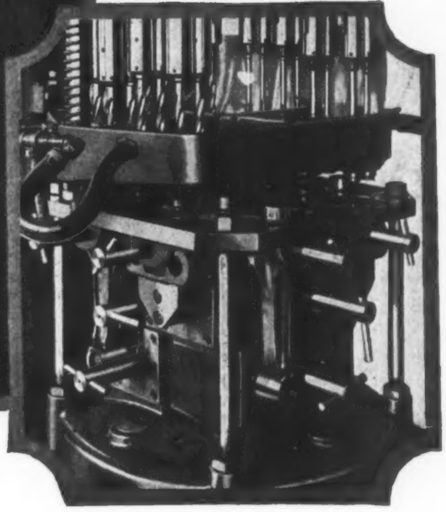


Fig. 6. Tubular Ways that Serve Also as Oil Reservoirs Insure a Constant Film of Oil between the Bed and Table Ways on the Ingersoll Machines

Fig. 7. This Combination Worm and Helical Gear Drives the Table of a Machine by the Worm Threads and is Driven by the Helical Gear Teeth

Design of Tools and Fixtures



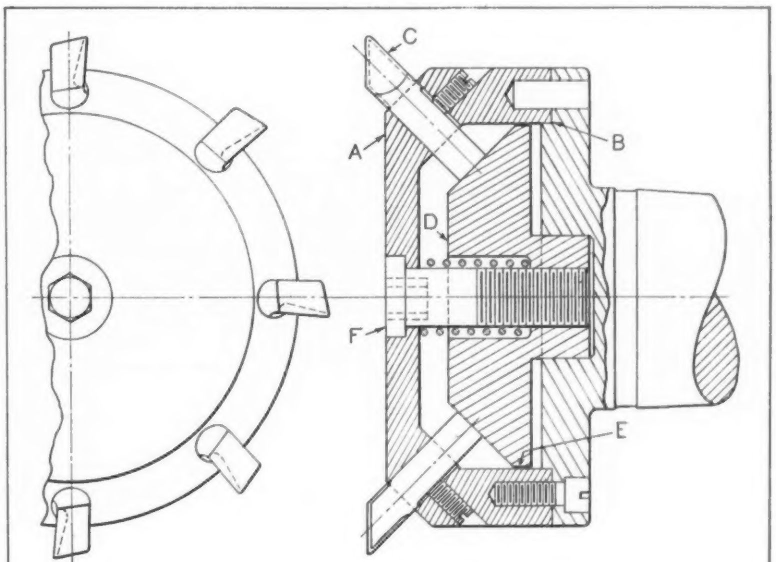
Multi-Toothed Adjustable Sweep Tool for Face Milling

By JOHN A. HONEGGER, New York City

Sweep tools for performing milling operations are generally of the single-tooth or double-tooth type. A sweep tool that more nearly approaches the milling cutter, because of its multi-toothed construction, and that can be readily adjusted for varying widths of cuts is shown in the accompanying illustration. A cutter of this type with the teeth spaced comparatively far apart often has decided advantages over the usual type of face milling cutter for facing brass, aluminum, bronze, and various other materials.

The cutter illustrated has a housing *A*, piloted on the tapered driving shank at *B*. Holes are reamed to a snug fit for the round bits *C*, which can be spaced at any angular interval desired. Within the housing is a tapered adjustable plug *D*. This plug has a clearance of several thousandths inch at *E*, but is a sliding fit in the tapered shank.

A helical spring serves to keep the plug *D* in tension against the head of screw *F*, so that when this screw is turned, the plug will automatically move in or out, as required. This adjusts the bits *C*, providing means for increasing or decreasing the cutting diameter. The bits are clamped in place after adjustment has been made by set-screws.



Sweep Type Milling Cutter with Adjustable Teeth

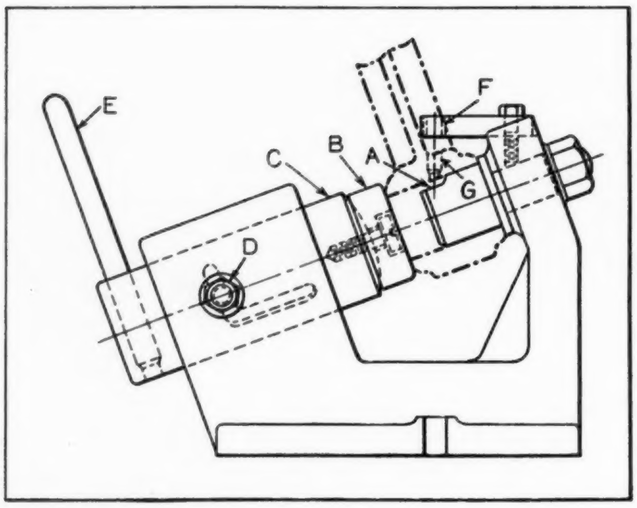
Jig Equipped with Quick-Acting Clamp

By EDWARD GREENSPON, Detroit, Mich.

A drill jig with a clamping nut of the slotted type was described in December MACHINERY, page 274. This jig would be improved by having no loose parts, which slow up the handling of the jig.

In the design referred to, the drill bushing may assume slightly different positions with relation to the center line of the drill spindle, the extent of misalignment depending on the variation in the width of the work. This would cause inaccuracy and excessive wear on the drill lands and the bushing.

A bayonet-lock clamping arrangement, such as used on the jig shown in the illustration, (see next page) is equally fast in operation and can be handled more conveniently than the slotted nut type. It is also less tiring for the operator, and provides a



Jig for Drilling Hole G in Part Shown by Heavy Dot-and-dash Lines

positive locking action. The drill bushing *F* in the jig illustrated is permanently fixed to the base, so that accurate location of the drilled hole *G* is assured. The clamping means is also an integral part of the jig and cannot become lost. The clamping lever or handle *E* is conveniently positioned and permits extremely rapid operation.

Referring to the illustration, the shoulder stud *A* extends into the work for about two-thirds of the length of the hole. This insures accurate location of the work and provides ample support against the thrust of the drill. The stud is flattened, as shown, to give ample drill clearance. The revolving cap *B* turns on a crown at the end of the clamping ram *C* and provides for a slight amount of float to compensate for possible variations in the work. As clamp *B* remains stationary during the actual turning or clamping motion of the ram *C*, scoring of the face of the work is avoided.

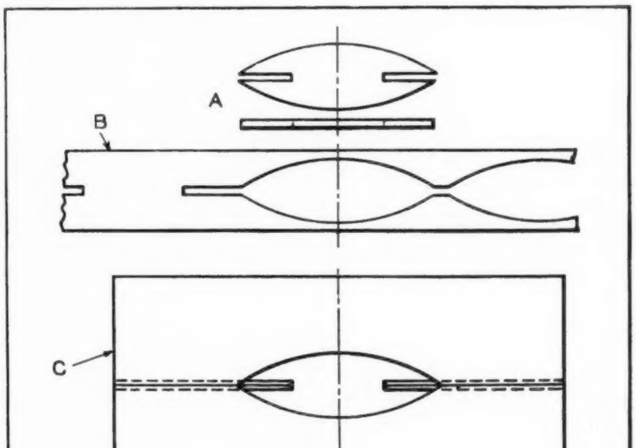
The bayonet slot is milled in the ram *C*, and the point of screw *D*, which is locked in place by a check-nut, slides in it. If required, two bayonet locks may be provided. In operation, the part is slipped over the stud *A* with one hand, while with the other hand, the handle *E* attached to the ram is pushed in and rotated with a single continuous motion.

Combination Blanking and Sizing Die

By L. KASPER, Philadelphia, Pa.

In producing the piece shown at *A* in a two-station die, piercing the slot at the first station and blanking at the second, trouble was experienced because the slots closed in when the pieces were blanked. As the slots were required to be accurate with regard to width, it was necessary to devise some means of overcoming this difficulty.

After grinding the cutting surface of the punch in various ways without overcoming the trouble, the die was changed as shown at *C* and *D*. The view at *C* is a plan of the die, and the view at *D* shows the inside of the die. The two pieces *E* were inserted between the two sections of the die with their inner ends extending into the blanking space. The projecting ends were tapered on their upper edges and corner. As the space above pieces *E* becomes filled with blanks, the lower blanks are forced over the pieces *E* burnishing the slots to a uniform size.



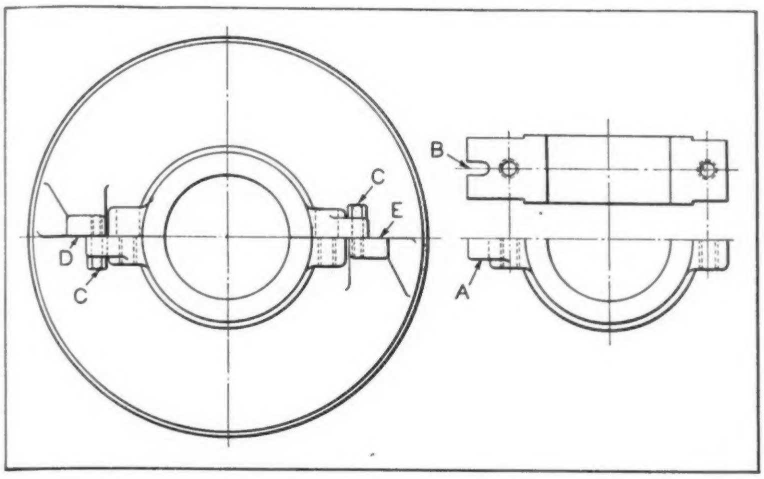
Blanking Die with Slot-sizing Inserts

Method that Insures Boring Split Bearing on Center Line

By WILLIAM M. HALLIDAY
Baildon, Yorkshire, England

The method used in boring split bearings to insure accurate centering of the bore described in November MACHINERY, page 198, is similar to the one here illustrated, which the writer has employed for a considerable time and which he believes has some advantages over the one previously described. The two halves of the bearing are provided with a cast-on extension *A* at one side only. This extension has a cast-in open-ended slot *B* of convenient width and length for receiving the clamping screw *C*.

The two halves of the bearing are assembled in exactly the same manner as in the method described in November MACHINERY—that is, with the slotted extensions on opposite sides of the bore. The normal stud holes for the bearings are used to



Faceplate Fixture for Boring Split Bearing of Special Design

hold the screws *C*. The holder plate is fastened to the lathe faceplate, on which it is located by means of a hub or pilot. The holder has two positioning lugs *D* and *E* for accurately locating or centering the work. The faces of these lugs are machined accurately to line up with the holder plate itself. Each lug is drilled and tapped to receive the screws *C*.

The fixture shown is simple to use. The two bearing halves are first fastened together, after which the assembly is inserted in the holder plate, the slotted extensions at each side bearing on the lugs provided for this purpose. The work is then secured by adjusting the clamping screws *C* which are passed through the bearing ends into the lugs. Thus, each bearing assembly is instantly located in a central position with respect to the lathe spindle and is securely locked in that position by simply tightening the two screws.

One of the advantages of this method is that it permits the operator to handle quite large bearings unaided. Other advantages are quick location of the work in the lathe; rapid clamping, as there are no plates or packing pieces to be adjusted; low cost of fixture; and no loose parts to become lost or misplaced.

Grid Piercing and Forming Die

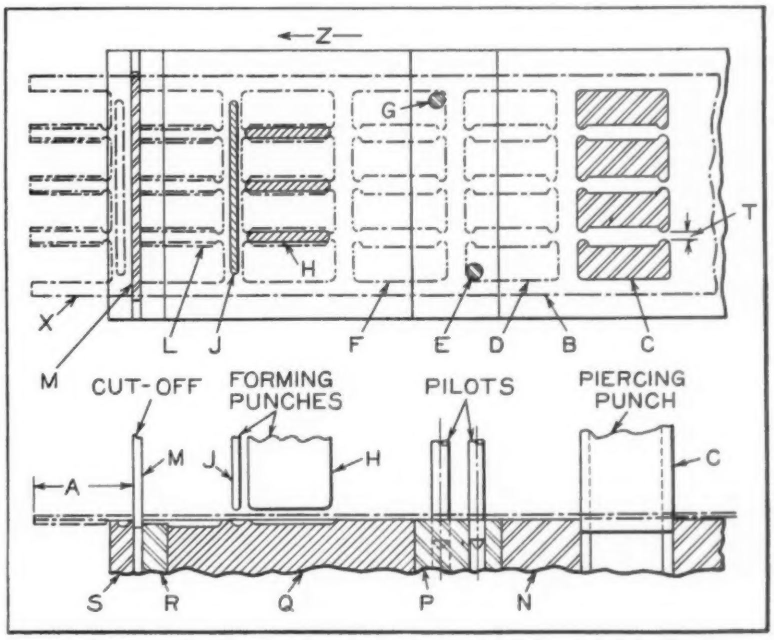
By F. SERVER

A grid piercing die in which two operations of shallow forming are combined is shown in the accompanying illustration. A finished piece, having a length indicated as *A*, is shown at *X*. The stock *B* from which this part is made is fed from right to left in the direction indicated by the arrow *Z*. The first operation consists of piercing a group of four holes with the punches shown at *C*. The work is then advanced to the position *D*, where a pin *E* enters a slot and partially locates the strip. After punches *C* pierce another row of holes, the strip is advanced to position *F*, where locating pin *G* enters one of the slots. The strip is then fed along, being located lengthwise for all succeeding operations by means of the two pins *E* and *G*.

This method of locating the work insures accurate spacing for the successive piercing and forming operations, which are performed while the unit is still an attached part of the stock. Three forming punches *H* and one crosswise forming punch *J* make shallow, curved depressions in the strip at the next station. No operations are performed at the succeeding station at *L*, which is left blank. At the following station is the shearing punch *M* which cuts off the finished strip *X* produced by the preceding piercing and forming operations.

Only the general arrangement of this die is shown in the illustration; the various sections are mounted on a base (not shown). These sections consist of the blanking portion *N*, the pilot pin section *P*, the forming section *Q*, and two sections *R* and *S* which jointly comprise the cutting-off die. It is necessary, in feeding the stock along, to raise it slightly above the piercing line of the die, so that the formed sections at the last station will be lifted out of the shallow depressions of the forming dies beneath punches *H* and *J*.

It might appear that the die is weak at *T*, although, actually, this distance is equal to over 1/2 inch. However, if the grids were much closer at this point it would be advisable to add another station, perforating the first and third slots at *C*, and the second and fourth slots at a preceding station.



Die for Piercing, Forming, and Cutting-off Grid Type Work

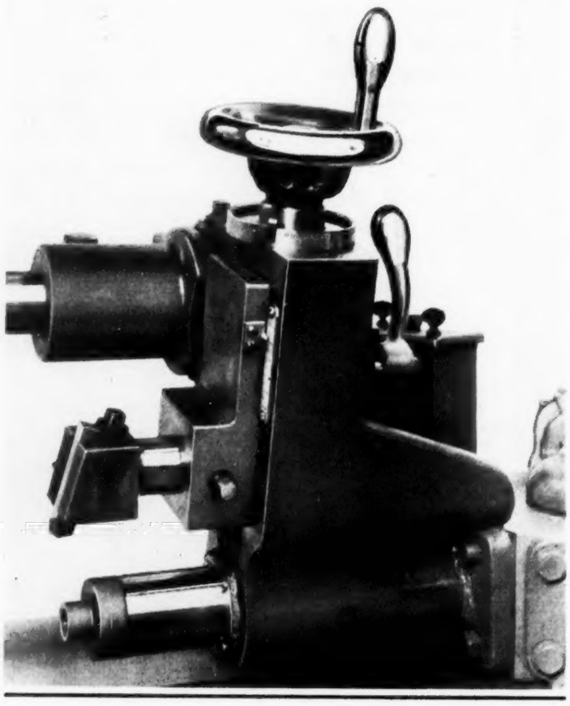


Fig. 1. Turret Lathe Tool with Hydraulically Operated Work-supporting Center

Hydraulically Operated Center and Pilot Support for Turret Lathe

By I. F. YEOMAN, Elkhart, Ind.

The tool equipment shown in Fig. 1 is used on the turret of a Fastermatic turret lathe in machining the sheave pulley *A*, Fig. 2. It is designed to hold the pulley in place against the shoulder on the work-supporting arbor by means of an oil-operated ram *D*. One of the principal objects of the ram is to maintain a practically constant pressure on the work, even though a feeding movement which carries the turning tool forward causes the ram to recede into the housing or cylinder. With this device, the work can be secured on the arbor more quickly than it can by means of holding devices that require the tightening of a nut against the work.

Oil-operated rams of this type can be built as an integral part of turret lathe tools designed for various purposes. With this equipment, the turret tools can be fed longitudinally while the work is adequately supported by a piloted arbor.

The plan view, Fig. 2, shows the reservoir *L* which contains the oil supply. At *D* is the sliding ram, which has a leather ring packing at *F* for forcing the oil up through the ball type valve *K* into the reservoir when the ram recedes into the cylinder. When the turret is backed away from the work, the spring *M* forces the ram outward until it is stopped by the shoulder *H*. The oil returns into the cylinder *N* through the valve indicated at *G* which is provided with a fairly large opening.

The compressing of spring *M* slightly increases the pressure applied to the work-supporting center, but this pressure is comparatively light and can be disregarded. The pressure applied against the work by the ram can be easily regulated to meet requirements by adjusting the screw *P* which acts on the ball valve through the spring *O*.

Several sizes of arbors can be used with a single tooling unit by employing adapters, such as the one shown at *E*. The adapter and the revolving center are the only rotating parts of the device. While the tool illustrated was used on a Fastermatic, it can be applied with equal advantage on almost any type of turret lathe.

* * *

Our Economic System is Cooperative as Well as Competitive

One observes that there is a great deal of competition in our economic system, and therefore it is called the competitive system. Our system does permit competition in useful or harmless activities, and there is consequently a great deal of competition. Our system also permits cooperation in the same class of activities, and there is also a great deal of cooperation. If there is more competition than cooperation, which is doubtful, it is not because cooperation is suppressed or competition favored, but because the people, if let alone, will compete more than they will cooperate. Our system is permissive, that is, it permits men to compete or to cooperate according to their own preferences and their ability to get along with their neighbors.—*Dr. T. N. Carver, in his book "What Must We Do to Save Our Economic System?"*

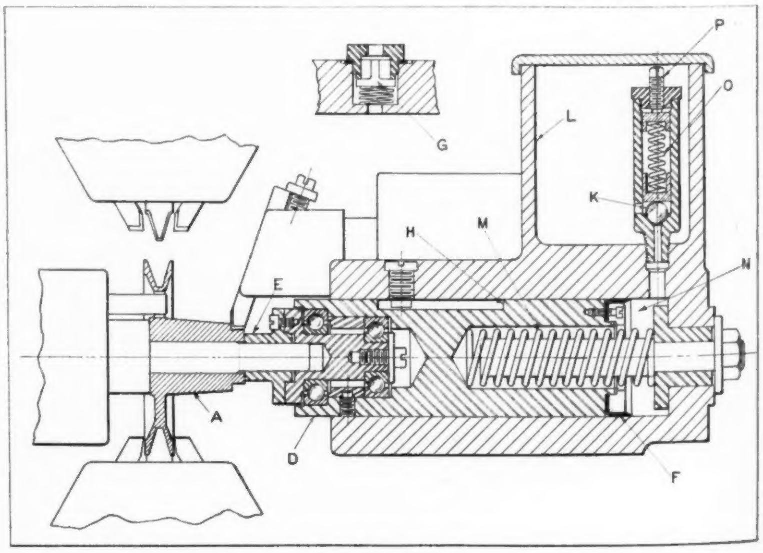


Fig. 2. Cross-section of Tool Shown in Fig. 1

Questions and Answers

A Department in which the Readers of MACHINERY are Given an Opportunity to Exchange Information on Questions Pertaining to the Machine Industries

Can Herringbone Gears be Designed Like Spur Gears?

C. T. R.—Is there some method of designing a herringbone gear which makes it possible to design it just like a spur gear? In certain books I have seen herringbone gear formulas which are the same as spur gear formulas, and diametral pitch is specified as "diametral pitch in plane of rotation." What is the meaning of this expression and can diametral pitch in plane of rotation be used under all conditions and in all formulas for designing herringbone gears?

When spur gears are replaced either by herringbone or single-helical gears without changing the center distance between the shafts or the gearing ratio, how are the herringbone gears designed?

A.—The diametral pitch in plane of rotation equals the number of gear teeth divided by the pitch diameter, the same as in the case of a spur gear. The diametral pitch obtained in this way may either be some standard pitch or it may be an odd fractional pitch. Diametral pitches such as 2, 2 1/2, 3, 3 1/2, 4, 5, 6, etc., are examples of standard diametral pitches such as are found in tables of tooth parts in engineering handbooks.

Herringbone gear teeth are cut to some standard tooth depth. The stub form of tooth is the most common, and the total depth of the American standard stub tooth equals 1.8 divided by some standard diametral pitch. If a full-depth tooth is required, then 2.157 is divided by some standard diametral pitch. If the diametral pitch in the plane of rotation is not standard, it cannot be used in formulas for calculating the addendum, dedendum, and total depth, because the tooth depth would not be standard.

Herringbone gear designing problems may be divided into three very general classes. In considering these three classes or cases, reference to diametral pitch will be made by way of illustration, but the same principle would apply if the gear were designed on the basis of circular pitch.

Case 1—When a special herringbone gear hob or cutter is used having some standard diametral pitch in the plane of rotation: Such a hob or cutter is special in that the tooth thickness is reduced an amount depending upon the helix angle, thus making the circular pitch of the gear, in the plane of rotation, equivalent to a standard diametral pitch.

Case 2—When a standard spur gear hob is used because a herringbone gear hob is not available: In this case, the diametral pitch of the hob represents the normal diametral pitch of the gear, and the diametral pitch in the plane of rotation will be an odd fractional pitch, unless the pitch in the plane of rotation is also made standard, as explained in the next paragraph.

Case 3—When a standard spur gear hob or cutter is used and a special helix angle is selected to make the diametral pitch in the plane of rotation standard, as when spur gears are to be replaced by herringbone gears without changing the center distance between the shafts or the ratio.

Procedure for Case 1—A herringbone gear to which Case 1 applies may be designed the same as a spur gear, and the inclination of the teeth relative to the axis can be ignored. Thus, if the diametral pitch in the plane of rotation is 4, this pitch will be used in all formulas requiring diametral pitch.

Procedure for Case 2—In this case, the pitch diameter equals

$$\frac{\text{Number of teeth}}{\text{Cos helix angle} \times \text{normal diametral pitch}}$$

This is equivalent to saying that the pitch diameter equals number of teeth divided by diametral pitch in plane of rotation, because the cosine of the helix angle multiplied by the normal pitch equals the diametral pitch in the plane of rotation. In all formulas relating to tooth depth, however (addendum, dedendum, and total depth), the normal diametral pitch or pitch of the hob would be used to obtain a standard tooth depth conforming to the pitch of the hob. To illustrate, assume that a standard spur gear hob of 4 diametral pitch is to be used; then, for a helix angle of 23 degrees (which angle has been extensively used for herringbone gears), the diametral pitch in the plane of rotation equals the cosine of 23 degrees multiplied by the normal pitch, which is 4 in this case. Thus, $0.9205 \times 4 = 3.682$ = diametral pitch in plane of rotation. The use of an odd fractional diametral pitch, such as 3.682, in a tooth depth formula would result in a depth greater than standard.

Procedure for Case 3—A spur gear transmission on some existing machine may be, and often is, replaced either by single-helical or double-helical (herringbone) gears, in which case both the center-to-center distance between the shafts and the gearing ratio must be retained. It may be possible to cut the helical or herringbone gears with a hob

of standard pitch, and, at the same time, obtain a pitch in the plane of rotation equal to that of the spur gearing by selecting the proper helix angle.

To illustrate the procedure in such cases by an example, assume that a machine has parallel shafts connected by spur gears having 30 and 90 teeth, respectively, of 6 diametral pitch. The center distance of 10 inches and the 3-to-1 ratio must be retained. The problem is to determine the pitch of the hob and the helix angle of the herringbone gears which are to replace the spur gears. The diametral pitch in the plane of rotation must be 6, since this is the pitch of the spur gears.

Select a hob or cutter having a diametral pitch equivalent to a slightly smaller tooth than that of the spur gearing to be replaced. Suppose a hob of 7 diametral pitch is used.

Divide the diametral pitch of the spur gearing (6 in this case) by the diametral pitch of the hob selected, or 7, thus obtaining the cosine of the helix angle required. Thus

$$\text{Cos helix angle} = \frac{6}{7} = 0.85711$$

The equivalent helix angle is 31 degrees. If a smaller angle is desired, suppose we try a hob of 1/2 inch circular pitch, assuming that one is available. A circular pitch of 1/2 inch is equivalent to a diametral pitch of 6.2832; hence

$$\text{Cos helix angle} = \frac{6}{6.2832} = 0.95493$$

This cosine is equivalent to a helix angle of 17 degrees 16 minutes. If the herringbone gear teeth are cut to this angle with a hob of 1/2 inch circular pitch, the diametral pitch in the plane of rotation will be 6; hence the pitch diameters of the herringbone gears will be the same as the pitch diameters of the spur gears. The tooth depth in this case would be based upon the normal pitch, which is 1/2 inch circular or 6.2832 diametral pitch. When spur gears are replaced by helical or herringbone gears, the tooth thickness of the latter is somewhat reduced; but all other conditions being equal, the helical or herringbone gears have a somewhat higher power-transmitting capacity.

Zinc or Zinc-Alloy Die-Castings

R. S.—What is the difference between zinc die-castings and zinc-alloy die-castings?

Answered by the New Jersey Zinc Co. New York City

Generally speaking, there are no zinc die-castings. Practically all die-castings made are zinc-alloy die-castings containing at least 93 per cent of zinc. Pure zinc can be die-cast, but it rarely is, because of the superior physical properties obtained when other constituents are added in comparatively small quantities. The tensile strength of pure zinc die-castings, for example, is only 14,000 pounds per square inch. They are rather brittle and, furthermore, the iron pots in which the zinc is melted are rapidly dissolved by the zinc.

By the simple expedient of adding about 4 per cent of aluminum to the zinc, it is possible to produce an alloy that has a tensile strength of about 40,000 pounds per square inch, with much greater toughness than pure zinc. Furthermore, this alloy does not attack the iron pots as severely as pure zinc. Another improvement is found in the increase in the fluidity of the metal which facilitates the casting of complicated shapes and thin sections.

It is, however, very important that the zinc used in these alloys be of great purity. Today zinc is produced commercially with a purity greater than 99.99 per cent, the remainder, which is considerably less than 0.01 per cent, being represented by very small quantities of lead, cadmium, and iron.

Research has revealed that the addition of copper improves the zinc-aluminum alloy. If from 1 to 3 per cent of copper is added to the zinc-aluminum alloy, the tensile strength and hardness of the alloy are increased, and stability of physical properties and dimensions is assured.

Magnesium may also be added instead of copper, the only difference being that the magnesium alloy does not have quite the tensile strength or hardness of the zinc-aluminum-copper alloy.

Many die-casters take the double precaution of adding both copper and magnesium to the zinc-aluminum alloys, and the present successful application of these alloys in thousands of parts demonstrates that this four-metal alloy produces die-castings of very satisfactory properties.

Gear Lubrication Problem

C. A. T.—We have to install a gear motor which is oil-lubricated and has Textolite gears running in mesh with steel gears. Ball bearings are used throughout. This unit will be installed in a high temperature, and in all probability, the temperature inside the gear housing will run around 300 degrees F. Can you suggest the correct grade and type of oil to be used? The lubrication will be applied by a force-feed system.

Answered by the Editor of "Oil-Ways," Published by the Standard Oil Co. of New Jersey

To provide an oil that will have the proper viscosity at the anticipated high operating temperatures, it will be necessary to use a highly refined cylinder oil of rather high viscosity at normal operating temperatures. At 300 degrees F. such an oil would have a viscosity of about 71 Saybolt seconds, or approximately that which would be possessed by oils of the grade recommended for the same type of service at normal temperature.

An Under-Cut Die-Casting Requires Sliding Die Parts

By CHARLES O. HERB

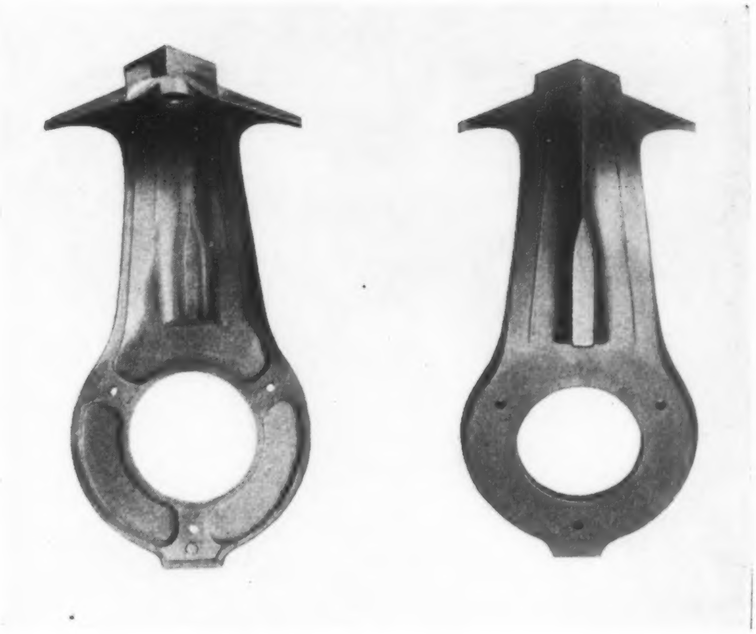


Fig. 1. Radiator Ornament of a Design that Requires Vertically Moving Members on the Movable Die

THE motor-truck radiator ornament shown in Fig. 1 is of such a design that considerable ingenuity was required in making die-casting dies for its production. Figs. 2 and 3 show the dies made by the Madison-Kipp Corporation, Madison, Wis., for this part. In Fig. 3 the stationary die is illustrated at the left and the movable member at the right. These dies were designed for use on an automatic die-casting machine built by the concern mentioned.

The flat portion of the radiator ornament and a large part of the curved portion are cast in the stationary die, as will be seen from the illustrations. However, the upper end of the curved portion is formed between sliding block *A* and moving core *B* of the movable die. Block *A* is moved upward and core *B* downward when the movable die is withdrawn from the stationary member, and they are,

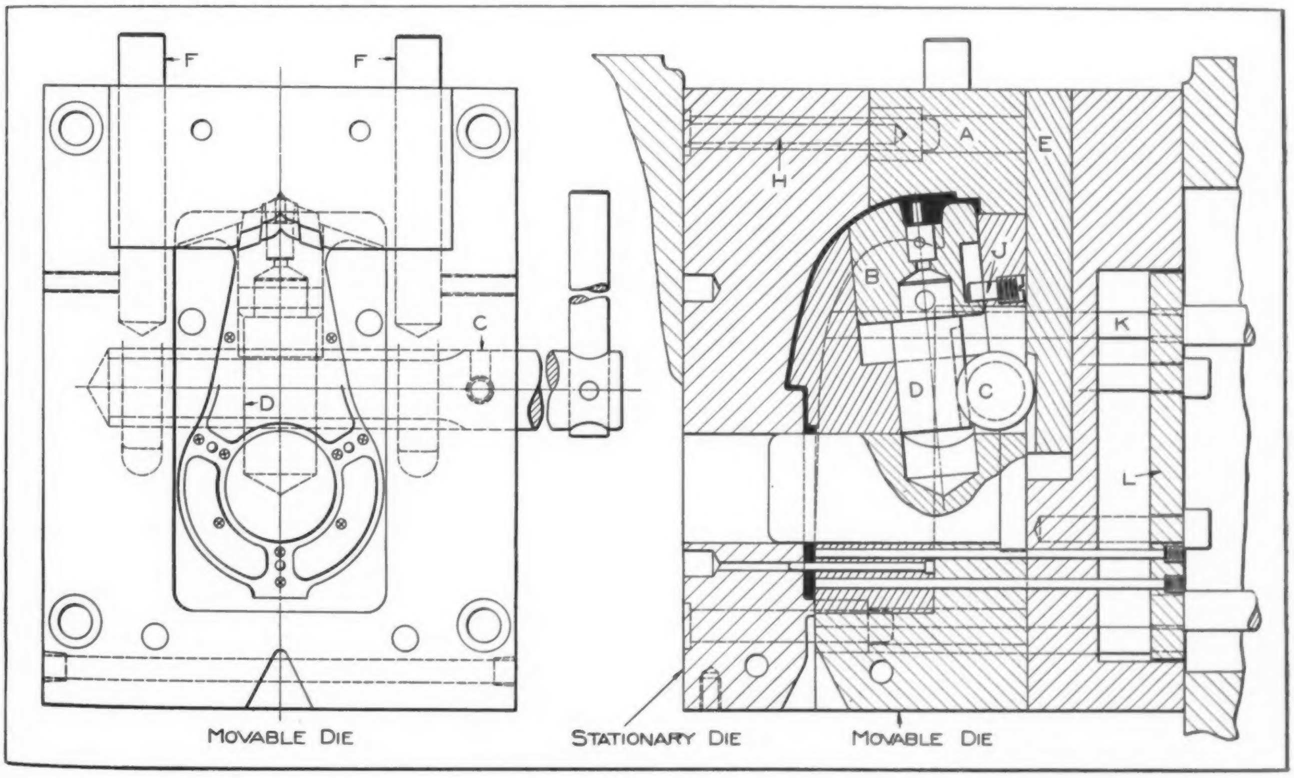


Fig. 2. Slide A and Core B of This Die Set, which Produces the Radiator Ornament Shown in Fig. 1, are Moved Vertically through the Rotation of Shaft C

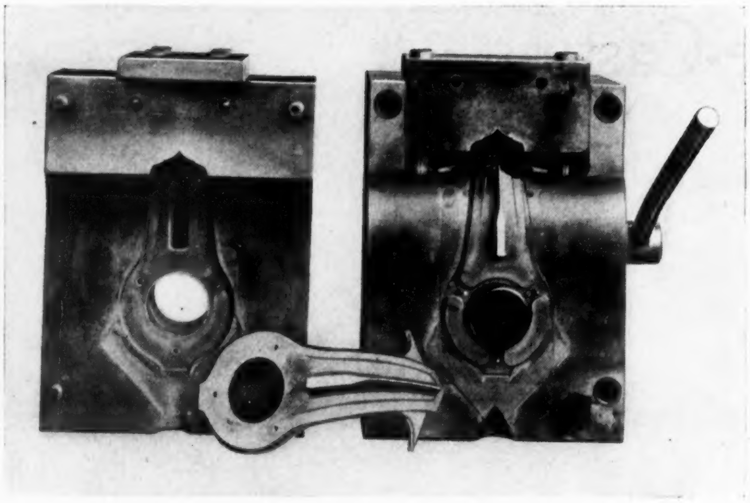


Fig. 3. Dies Designed for Producing the Radiator Ornament Shown in Fig. 1 at the Rate of 120 Castings an Hour

of course, moved in the opposite directions when the dies are closed.

Both block *A* and core *B* are actuated when the handle attached to the end of shaft *C* strikes stops on the machine frame. Shaft *C* is provided with spur gear teeth for the greater part of its length, which engage rack teeth cut on shank *D* and at two points on slide *E*. Block *A* is mounted on slide *E* and, of course, moves with it. The provision of two sets of rack teeth on slide *E* balances the power applied to it.

Block *A* is piloted up and down on the movable die by pins *F*, which also serve to hold the block to the die. It is positioned correctly with respect to the stationary die by two pins *H* which engage holes in the face of block *A*. The upper or casting position of core *B* is controlled by stud *J* engaging a slot in the core.

Pins up to 7 inches long are mounted on plate *L* for ejecting the finished casting from the cavity when the dies are opened, there being a total of ten ejecting pins. Two pins *K* contact with the face of the stationary die when the movable die is closed against it and push plate *L* and the ejecting pins back into the positions shown.

The radiator ornament is made of zinc. The average production is 120 pieces an hour.

MACHINERY Brings Out a New Book on Die-Casting

DIE-CASTING. By Charles O. Herb. 300 pages, 6 by 9 inches; 178 illustrations. Published by THE INDUSTRIAL PRESS, 148 Lafayette St., New York City. Price, $3.

The publishers of MACHINERY and MACHINERY'S HANDBOOK have produced this book on die-casting because of the many inquiries received for a treatise that would fully cover this very important development in modern manufacturing practice. The book covers die-casting from its earliest phases up to today's advanced practice, including the brass die-casting process which has made notable advances during the last few years, and even dealing with a very recent development in cast iron die-casting.

A distinctive feature of the book consists of numerous illustrations and detail descriptions of dies for parts ranging from simple shapes to very intricate forms. These various die designs illustrate the different fundamental principles of construction. To further aid the die designer there is a section that illustrates and describes die standards adopted by a leading manufacturer of die-casting equipment.

The book deals with die-casting machines from the earliest to the latest types, covers the important subject of the die steels required for different die-cast metals and presents the analyses and properties of the commonly used die-casting alloys.

A general idea of the scope and character of the information given in this book may be obtained from the following list of sixteen main chapters or sections: Die-Casting Process and Its Applications; Die-Casting Machines and Their Development; Alloys for Die-Castings; Die-Casting Dies and Their Operation; Two or More Castings at Each "Shot"; Dies with Auxiliary Slides for Exterior Cores; Sliding Cores in Movable and Stationary Dies; Adjustable Dies for Parts of Different Dimensions; Standards for Designing Die-Casting Dies; Steels Used for Die-Casting Dies; Die-Casting with Machines of Simple Design; Die-Casting Thin Sections; Brass Die-Casting Process; Die-Casting Aluminum Bronze by Vacuum Process; Unit System of Die-Casting; and Die-Casting Cast Iron.

The dies, which constitute such an important feature of the book, have been classified in groups according to the most distinguishing characteristics to facilitate locating a general design or type of die adapted to a given class of work. The book contains a great deal of practical die-casting data relating to rates of production, pressures, alloys used for different applications, etc.—facts obtained from specialists in die-casting practice. A complete index at the end enables the user to readily find desired information. This book is believed to be the most complete treatise at the present time on a subject of great importance in many lines of manufacture.

General Electric Commemorates a Fifty-Year Anniversary

On June 13 and 14, Schenectady's half-century of electrical progress was celebrated in that city to commemorate the establishment of the electrical industry there by Thomas Alva Edison. It was on June 14, 1886 that Edison took title to two abandoned shops of the McQueen Locomotive Co. as a new location for the Edison Machine Works. This laid the foundation for an industry in Schenectady that later developed into the General Electric Co. The two buildings originally acquired by Mr. Edison are still part of the General Electric plant, but scores of buildings, many of much larger proportions, are now surrounding these old landmarks of earlier days.

During the celebration, the General Electric Works had "open house," which some 5000 visitors attended. Business and industrial leaders from all sections of the country were present at the celebration. Charles A. Edison, son of the famous inventor, and W. S. Barstow, an Edison pioneer and president of the Thomas Edison Foundation, were among the guests. In several of the speeches made, the rapid development of the electrical industry in the last fifty years was reviewed. Several of the speakers drew a picture of an even more rapid progress of the industry in the future.

Naming the River Road in Schenectady Rice Road in Honor of the Late E. W. Rice, Jr., Second President of the General Electric Co. and Founder of the General Electric Research Laboratory, as Part of the Fiftieth Anniversary Celebration

A New Industry Increases Demand for Machine Shop Equipment

According to George R. Kinney, sales manager of the Niagara Machine & Tool Works, Buffalo, N. Y., which company builds presses, shears, and machines for plate and sheet-metal work, the manufacturing and contracting divisions of the air-conditioning industry are playing an important part in the general increase in machinery sales All the branches of the air-conditioning industry contribute to this demand for machinery, according to Mr. Kinney, including manufacturers of heating and cooling equipment, grilles, air filters, fans, ducts, and other component parts. The demand for sheet-metal working machinery on the part of contractors who are making the actual installations is noteworthy. The manufacturers buy mainly heavy power-operated machines, while the contractors are buying both power- and foot-operated machines.

* * *

The machinery of the new liner *Queen Mary* makes use of alloy steels almost throughout. Nickel steels, for example, are used for the reduction gears, turbine and propeller shafts, turbine nozzle vanes, and many other parts.

Two-Stage Piercing, Blanking and Curling Die

By MORELL JOHNSON

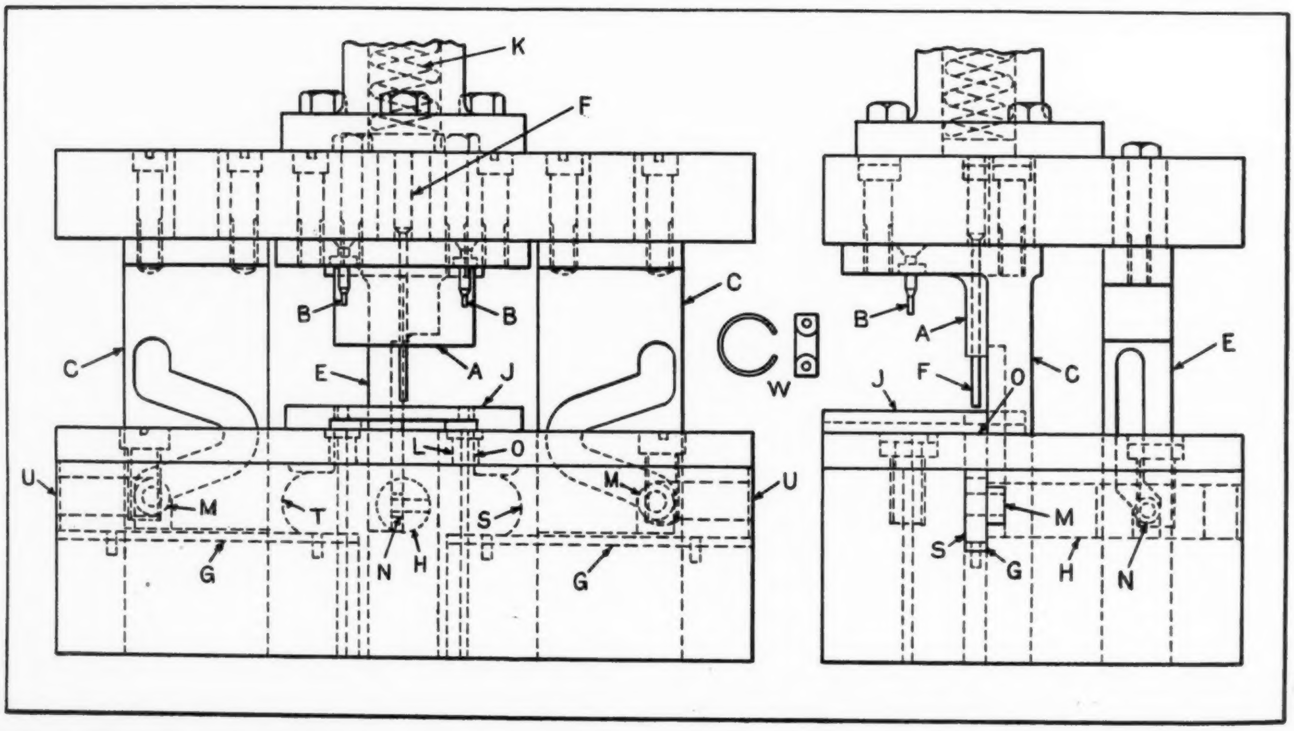
ALTHOUGH the clip shown at *W* in the accompanying illustrations is a simple part, the die used in forming it is of rather unusual design. The material used for the part is common 18-gage black iron, cut or sheared off in strips 2 1/8 inches wide. The flat strip stock is fed in at the front of the die through the slot in the stripper *J*, Fig. 1. The two holes in the piece are pierced by the punches *B* in the first position or stage. Then the strip is advanced and the holes are pierced in two successive blanks. When the stock has been advanced to the position for piercing the holes for the third blank, the holes first pierced are directly under the blanking punch *A*.

On the next stroke of the press, the first piece is blanked out and carried down until it rests on top of arbor *H*. At the same time, two holes are pierced for another blank. On the up stroke, the slides *S* and *T* move inward, forming the piece to the finished shape around arbor *H*, which is withdrawn from the work when the press ram nears the upper end of its stroke, allowing the finished piece to drop out through an opening in the bottom of the die. Thus a completely finished clip or piece of work is produced at each stroke of the press.

The curling slides *S* and *T*, with their cam-rollers *M* attached, are shown in the upper right-hand corner of Fig. 2. There are two prongs on the right-hand slide *S* and a single prong on the left-hand slide *T*. Hence the prongs on the two slides dovetail when the ends meet. The radius of the forming ends of the slides is the same as the outside radius of the clip. The straight portions of the prongs serve to guide the blank and also to keep it from buckling while the radius-forming ends are starting the curling operation. The amount of movement imparted to each curling slide is equal to the radius of the formed end plus the straight portion of the prong plus one-half the length of the blank.

Three guide posts pilot the punch in the die. The two rectangular-section guide posts *C*, shown near the front of the die, are made right- and left-hand. These posts have cam grooves cut in their sides for actuating the curling slides *S* and *T*. The third guide post *E*, at the rear, is cylindrical and has a flat surface milled on one side in which there is a cam groove which actuates the arbor *H*, causing it to be withdrawn from the work after the slides *S* and *T* have curled the work around the

Fig. 1. Front and Side Views of Two-stage Die which Pierces, Blanks, and Curls Clip to the Shape Shown at W



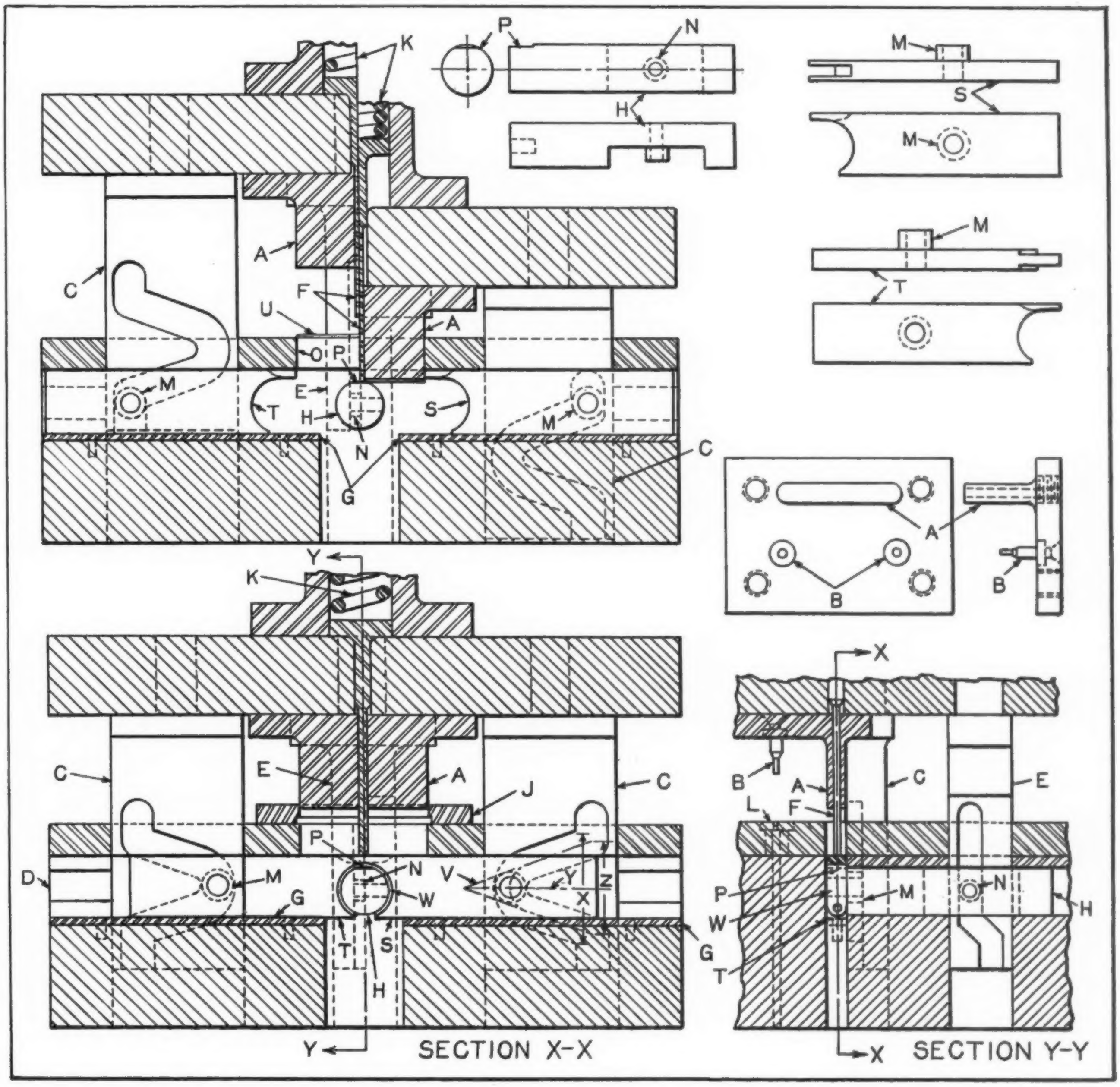


Fig. 2. Cross-section Views Illustrating Operation of Die Shown in Fig. 1, and Separate Views of Slides, Guides, and Punches

arbor. Angle V of the cam groove in post C (section X–X, Fig. 2) is governed primarily by the length of the press stroke, the longer the stroke, the larger the angle, as the larger angle results in imparting a smoother action to the curling slides. The vertical line Z shown in section X–X, Fig. 2, represents the length of the press stroke minus a small dwell in the movement of the slides, which occurs just before the direction of the stroke changes. The full stroke of the press is represented by X.

The arbor H around which the blank is curled is shown by two separate views at the top of Fig. 2. The depth of the wide slot in the arbor is equal to one-half the diameter of the arbor, and the width is equal to the diameter of the rear guide post E plus the width of the work or blank. The cam-roller N is located in the center of the slot. There is a shallow spot or flat P milled on one end of the arbor at right angles to the slot. It is around this end that the blank is curled.

One-half of the rear guide post E is milled away to form the flat face in which the cam groove for roller N is milled. The angle of the cam groove which connects the two vertical portions of the groove is 45 degrees. The centers of the vertical grooves are the width of the blank apart. This distance represents the travel of the arbor. The punches B for piercing the small holes have their common center line located three times the width of the blank from the center of the blanking punch A. It will be noted that the blanking punch is much longer than the small piercing punches.

The spring K in the hollow shank of the punch-holder exerts pressure on the head of rod F which extends from a hole in the punch pad through the

center of the blanking punch. The stripper J is the ordinary type, with a stop which halts the strip stock just even with the outside edge of the blanking slot O. The two views of the assembled punch and die in Fig. 1 show the punch at the top of its stroke and the slides in their outer positions. The section view through the center of the punch and die in the upper half of Fig. 2 shows the punch at the top of its stroke in the left-hand side and at the bottom in the right-hand side. At the left-hand side, the strip stock U is shown in position to be pierced and blanked. As the punch descends, the pressure of rod F holds the stock in place until it is pierced and blanked.

Operation of Die

The blanking punch shears off the blank and carries it down into the die. While the punch is approaching the end of its stroke, the rear guide-post cam E causes the arbor H to advance into the opening below slot O. In the meantime, cams C cause the slides to move outward. This movement is so timed that when the blank reaches the top of the slides, the slides have moved outward until their ends just clear the descending blank. Movement of the slides stops at this point when the rolls M reach the straight vertical portions of the cam-slots in the guides C, as shown in the right half of the upper cross-sectional view, Fig. 2. The ends of the slides now form a nest which keeps the blank from shifting while it is being pushed down and deposited on the flat spot P of the arbor H, which has now been advanced to the position shown in section Y–Y.

The end of rod F is roughened, so that it holds the blank firmly on the flat spot P after the punch begins to rise. The flat spot is made just large enough to insure holding the blank in a horizontal position. Meanwhile, the punches B pierce two small holes in the stock. When the punch rises just beyond the top of the slides S and T, the slides begin to travel inward. The rod F continues to hold the blank on the arbor until the punch is high enough to release the pressure on the blank. The length of the rod is such that it just clears the incoming slides.

The positions of the various moving parts of the die when the punch is half way up are shown by the section X–X, Fig. 2. In this view, the cam-rollers of the slides are just in the center of the curve; hence the slides have reached the end of their inward travel and have their prongs dovetailed, so that their two radius-formed ends form an almost complete circle. Blank W is here shown completely curled around arbor H.

Continued upward travel of the punch causes the slides to travel outward again. When the punch has nearly completed its upward movement, the slides will be near the end of their travel and the cam groove in post E will have caused the arbor to be withdrawn, thus stripping off the finished clip which falls through the opening in the bottom of the die. During the downward half of the stroke, the slides S and T and the arbor H are caused to go through their various movements without performing any work, because the cam-rollers traverse the same path during both the downward and upward motion of the punch.

In order that the slides with the rollers can be conveniently slipped into place, grooves D are cut in the die-block with sufficient clearance to allow the rollers to pass through. The stripper J is not shown in some of the views for the sake of clarity. The hardened steel shoes G on which the slides travel are provided to protect the die-block against wear. The press on which the die is used has a stroke of 1 3/4 inches, and in operation, is tripped each time a clip falls from the die.

* * *

Design Chart for Arc-Welded Products

A new engineering drafting-room chart which presents, in concise form, the data necessary for producing arc-welded designs has been published by the Lincoln Electric Co., Cleveland, Ohio. The new chart will be found particularly helpful in drafting-rooms where the product is changed over from conventional methods to arc-welded construction. The data given include weld symbols for working drawings, illustrations and descriptions of sixteen types of joints for arc welding, suggestions for better arc-welded design, sketches explaining the nomenclature of welds and weld dimensions, a comparison of welded and riveted drawings, and tables giving properties of base metals, weld metals, and electrode metals for hard-facing, as well as length of fillet weld to replace rivets, and safe allowable loads for fillet welds in shear.

The chart is printed in such a way that it is suitable for blueprinting. This permits copies of the chart to be made and distributed to individual draftsmen and others concerned with product design. The chart is approximately 24 by 36 inches. Engineers or others in charge of drafting-rooms can obtain a copy by writing to the Lincoln Electric Co., Welding Engineering Department, Cleveland, Ohio.

* * *

There are many plants operating old-type machine tools which are still perfectly serviceable and which still do the work for which they were designed. Because they still operate satisfactorily, production men often assume that they represent proper operating efficiency and need not be replaced. But while they may operate efficiently from the standpoint of workmanship, they may be highly inefficient from the standpoint of time. From that point of view, they may have become obsolete, and should be replaced by machines or a newer type.—*Walter K. Bailey*

Westinghouse Equips New Plant for Air-Conditioning Units

The manufacture of air-conditioning equipment is developing into a large industry. There are approximately 175 manufacturers of air-conditioning equipment of all kinds, nearly twenty of whom manufacture unit systems of the self-contained type and central station systems which include evaporators and compressors remotely installed. The remaining manufacturers include the group that produces accessories for complete installations. In 1935, the total business of this branch of the machine industry was close to $50,000,000.

For the first three months of 1936, an accumulative report of twenty-seven manufacturers of condensing and evaporator air-conditioning units showed an increase of nearly 25 per cent over the same period in 1935—a most remarkable indication of the rapid growth of the industry.

It is also interesting to note that industrial air-conditioning installations are constituting a constantly larger percentage of the total installations. In 1935, the industrial installations accounted for nearly 20 per cent of the total, while small stores and restaurants accounted for about 20 per cent, large stores and theaters for another 20 per cent, residential installations for nearly 20 per cent, and railway cars for over 10 per cent, the remainder being miscellaneous installations.

To meet the growing demand for air-conditioning equipment the Westinghouse Electric & Mfg. Co. has just equipped a 40,000 square foot factory at its East Springfield, Mass., plant to manufacture a new design of air-conditioning compressor. The company has spent approximately $500,000 in equipping this plant. It is laid out to produce, in a most economical manner, hermetically sealed compressors and self-contained room cooling units.

An interesting feature of this new plant is that it makes use of air-conditioning itself to a considerable extent. The assembly room is glass-enclosed within the remainder of the plant. The various compressor parts are thoroughly cleaned by automatic cleaning machinery, and are then assembled in an air-conditioned, dust-free room. Into this assembly room is introduced filtered outside air under a slight pressure. This slight pressure causes the air to leak from the room rather than into it. This precaution is taken so as to keep the compressor as free from dirt as possible while being assembled, thus insuring many years of service-free operation. The temperature is also maintained as nearly constant as possible.

Another interesting feature in connection with this new development, which indicates the present trend in simplifying designs, should be mentioned. A previous 25-horsepower design of air-conditioning compressor weighed 3400 pounds. This has been redesigned into a unit weighing only 2000 pounds; at the same time, the refrigeration output has been increased about 16 per cent.

Gray Iron Castings are No Longer Just Cast Iron

The gray iron cast to specifications today must not be thought of in the terms of the cast iron of yesterday. Instead of the doubtful 20,000 pounds per square inch tensile strength generally assumed to be the safe limit for gray iron castings, castings may now be obtained having a definite tensile strength anywhere up to 60,000 pounds per square inch without resorting to heat-treatment. Cast malleable parts subjected to a definite heat-treatment have been made with a tensile strength of up to 120,000 pounds per square inch. In these high-strength cast irons, alloying metals like nickel and chromium are used to increase the strength. Malleable iron with a tensile strength of from 10,000 to 25,000 pounds per square inch *greater* than that of ordinary malleable iron has been obtained by adding chromium and silicon to the composition. Chromium increases the hardness and strength, while silicon counteracts the inhibiting effect of chromium in the annealing process.

* * *

Savings Obtained with Diesel Engines

It is not only through the installation of up-to-date machine shop equipment that costs may be reduced. Power plant equipment often offers similar opportunities for savings. Our attention was recently called to an installation at the James J. Ryan Tool Works of Southington, Conn., where a Fairbanks-Morse Diesel engine recently was installed, direct-connected to an alternator. An accurate record of the cost of power as obtained from the Diesel plant, compared with power bought from a public utility company, indicated that during a period of 550 working hours the saving amounted to approximately $220.

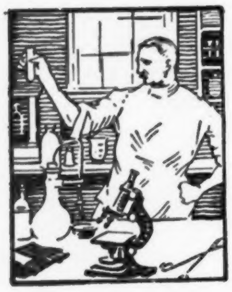
* * *

Packard Provides Vacations and Retirement Pay for Factory Workers

The Packard Motor Car Co. announces that employes on an hourly wage-rate basis, with a year or more of continuous service prior to June 1, 1936, will receive, beginning this summer, a week's vacation with pay at their hourly rate. Over 7000 Packard workers, it is estimated, will be entitled to vacations this summer.

For hourly-rate employes sixty-five years of age or over, with long service records, retirement pay is provided. Employes with fifteen or more years of service will, when they retire, receive $25 a year for each year of past service. The Packard company has an unusual employe service record. Of its hourly-rate factory workers, 46.5 per cent have been with Packard from five to thirty years.

MATERIALS OF INDUSTRY



THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

Armco "Stabilized" Steel for Deep-Drawing Operations

A uniform deep-drawing and non-aging cold-rolled steel from which all stretcher strain is permanently eliminated in the tempered condition has been placed on the market in sheets and strips by the American Rolling Mill Co., Middletown, Ohio. This "Stabilized" steel is said to retain indefinitely all the properties of temper-rolled steel, thus making prefabrication treatment unnecessary, regardless of the length of time that the metal is held in stock.

It is claimed that this metal has no sharp yield point in the temper-rolled condition. It has been found to resist cracking in unusually severe drawing operations.

Molybdenum-Iron Castings Withstand 3000-Pound Pressures

In the drilling of oil wells, it is the practice to use a slush pump for circulating water through the casing. This pump must resist pressures of 3000 pounds per square inch. For this class of service, the Gardner-Denver Co., Quincy, Ill., manufactures pumps, the main parts of which are made from a cast iron containing 0.70 to 0.90 per cent molybdenum. To insure satisfactory operation at high pressures, these parts must pass inspection at a pressure of 5000 pounds per square inch.

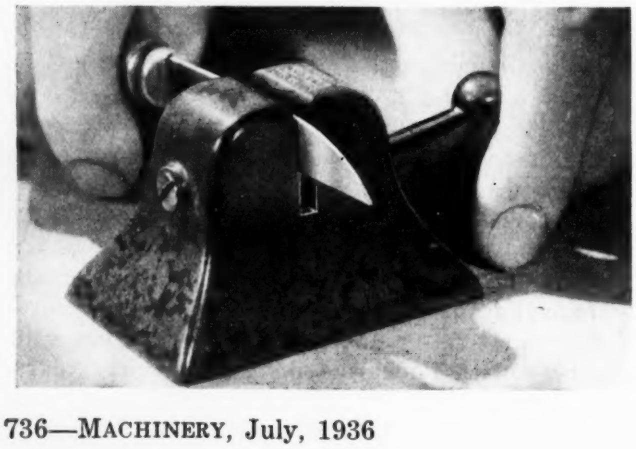
The castings possess a tensile strength of 60,000 pounds per square inch. In addition to strength; the castings show unusual resistance to wear, have a close grain that prevents leakage, and possess a high impact strength.

Composition and Properties of Ford Crankshafts

The Ford Motor Co. created a considerable stir in automotive circles two years or so ago by the adoption of crankshafts cast from a steel alloy. The analysis of this alloy was disclosed in a paper read by W. F. Pioch before the Production Meeting of the Society of Automotive Engineers, held recently in Detroit. The composition is as follows: Chromium, 0.40 to 0.50 per cent; silicon, 0.85 to 1.10 per cent; manganese, 0.60 to 0.80 per cent; carbon, 1.35 to 1.60 per cent; copper, 1.50 to 2.00 per cent; phosphorus, 0.10 per cent maximum; and sulphur, 0.06 per cent maximum.

Torsion tests conducted on the cast crankshafts show an elastic limit ranging from 88,000 to 96,500 pounds per square inch and an ultimate tensile strength ranging from 128,000 to 130,000 pounds per square inch. The Brinell hardness number varies between 255 and 321.

The alloy for these crankshafts is melted in four electric furnaces of 15 tons capacity each. The time required to bring the furnace from a cool charge to the pouring time is about 3 1/2 hours.



The "Rotary" Knife Sharpener Here Illustrated is Molded from Bakelite. Attractive Colors that are not Obtainable in Metal Provide Good Selling Points

The pouring range is between 2670 and 2700 degrees F. After the cast crankshafts reach normal atmospheric temperature, they are heated in a double-deck furnace to 1650 degrees F. within one hour and held at that temperature for twenty minutes. They are then permitted to cool to 1000 degrees F. in air, after which they are reheated to 1400 degrees F. within an hour and held at that temperature for one hour. The crankshafts are discharged from this furnace at a temperature of 1000 degrees F. and placed on a cooling conveyor for delivery to the cleaning room.

Resins that are as Elastic as Rubber

Acronal resins which are said to equal or surpass rubber in elasticity have been introduced on the American market by the Advance Solvents and Chemical Corporation, 245 Fifth Ave., New York City. These resins are especially suitable for electrical insulation purposes, and they are also resistant to mineral oils, gasoline, dilute acids and alkalies. Films of Acronal resins will adhere well to most surfaces, and in practically all cases, such adhesion is enhanced by baking or drying.

Two modifications of Acronal resins are now on the market. These may be used as clear metal lacquers, adhesives, electrical insulation, and for many other purposes.

Molybdenum Cast Iron and Steel Used in Building Diesel Engines

Diesel engines used to be so heavy, according to the *Moly Matrix*, published by the Climax Molybdenum Co., New York City, that their application was limited by the strength of the emplacement that could be provided. They were also very slow. and their horsepower per pound ratio was so low that it was impracticable to apply them to anything mobile smaller than an ocean-going vessel.

Now Diesel engines are prime movers of tractors, motor buses, and industrial locomotives, and are even being developed for aircraft. Their modernization into the present light-weight, high-speed form has been accomplished through engineering ingenuity and the use of high quality materials in their construction.

In the Diesel engines built by the Hercules Motors Corporation, Canton, Ohio, for instance, molybdenum iron is used for the cylinder blocks, heads and liners; gear covers; flywheels; exhaust manifolds; and bell housings. Molybdenum steel parts include the crankshaft, connecting-rods and caps, piston-pins and studs, and nuts and bolts.

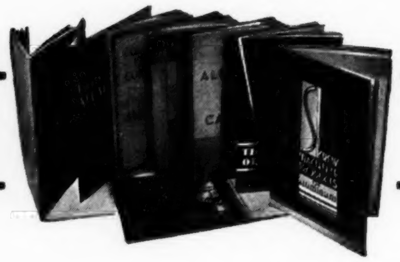
Permanent Magnets Hold the Work on a New Magnetic Chuck

Permanent magnets instead of electromagnets are used in a self-contained non-electric magnetic chuck manufactured by James Neill & Co., Ltd., Sheffield, England. The permanent magnets, according to *Nickel Steel Topics*, published by the International Nickel Co., New York City, are made from a nickel-aluminum steel containing approximately 24 per cent nickel. This alloy provides unusually high magnetic energy and possesses a high coercive value which is said to insure permanence of the magnet system. Length of service, vibration, and temperature do not reduce the magnetism. The case of the chuck is cast aluminum or a non-magnetic nickel-alloy cast iron.

New Alloy Adopted for Electrical Resistance Standards

Manganin, an alloy of copper, manganese, and nickel, is generally used as a resistance alloy for the wire-wound standards that maintain the unit of electrical resistance in our national standardizing laboratories. The United States Bureau of Standards, however, has recently found that an alloy consisting of 85 per cent copper, 9.5 per cent manganese, and 5.5 per cent aluminum is superior in several respects for this purpose. Alloys for the use mentioned must be very stable in resistance. When properly baked, coils of wire made from the new alloy show advantages over Manganin.

A Slide Fastener on which the Interlocking Elements are Die-cast from Zinc Alloy Directly on Fastener Tape at Great Speed. Photo Courtesy New Jersey Zinc Co.

NEW TRADE  LITERATURE

Recent Publications on Machine Shop Equipment, Unit Parts, and Materials. Copies can be Obtained by Writing Directly to the Manufacturer.

Precision Boring and Grinding Machines

EX-CELL-O AIRCRAFT & TOOL CORPORATION, 1200 Oakman Blvd., Detroit, Mich. Catalogue PB-136, illustrating and describing in detail the three styles of XLO Senior precision boring machines, adapted for high production, large work, or a number of precision operations on one or more pieces at the same time. Catalogue PB-1035, describing operations on XLO Junior single- and double-end precision boring machines. Bulletin TG-135, descriptive of the XLO grinder for precision threads.

Electric Control Equipment

LEEDS & NORTHRUP CO., 4921 Stenton Ave., Philadelphia, Pa. Catalogue N-OOA, entitled "Micromax Electric Control," descriptive of a complete new control system for regulating input in proportion to demand. The booklet describes the three integral parts of which this equipment consists—namely, the Micromax control instrument; relay detector; and valve mechanism. It explains how the balancing mechanism works and describes the wide range of applications of this equipment.

Nickel-Alloy Steels

INTERNATIONAL NICKEL CO., INC., 67 Wall St., New York City. "Buyer's Guide to Warehouse Stocks of Nickel-Alloy Steels," containing a list of the warehouse distributors throughout the United States and Canada, and the compositions, forms, and minimum and maximum sizes of nickel-alloy steels and stainless steels regularly carried in stock by each concern. The data is classified territorially by sections and cities. A list of the principal trade names of the class of steels referred to is included.

Zinc-Base Die-Cast Alloys

APEX SMELTING CO., 2554 Fillmore St., Chicago, Ill. Metalgram No. 10, containing a summary of the results obtained in testing zinc-base die-cast alloy No. 3. The tables give tensile strength, dimensional change, elongation, and impact strength for different metal and die temperatures and various pressures.

Metalgram No. 11 containing charts giving the tensile strength of No. 5 zinc-base die-cast alloy at different metal and die temperatures and pressures.

Thread-Cutting Equipment

LANDIS MACHINE CO., INC., Waynesboro, Pa. Catalogue containing data on the results actually obtained in various plants with Landis threading machines, die-heads and collapsible taps. Definite production figures, savings effected, and other essential information are given in each case, which makes the book a valuable guide to the production possibilities of this equipment. Those concerned with this class of work will find much of suggestive value in this book.

Cold-Rolled Strip Steel

THOMAS STEEL CO., Warren, Ohio. Handbook on cold-rolled strip steel, containing tables of weights of cold-rolled steel for thicknesses from 0.2757 inch (No. 1 gage) to 0.001 inch (No. 30 gage) and for widths from 1/4 inch to 24 inches. The handbook also contains an illustrated description of the five different tempers in which this strip steel is supplied, as well as a description of the different edges, finishes, and zinc and copper coatings.

Grinding Lathe Tools

SOUTH BEND LATHE WORKS, 724 E. Madison St., South Bend, Ind. Bulletin 35, entitled "How to Grind Lathe Tool Cutter Bits," describing methods for grinding all the common types of lathe tool cutter bits, and illustrating the particular angles to which each cutter bit should be ground. The applications for which each of these tools are used are described and the manner of applying the tool to the work to obtain the maximum efficiency is illustrated. A nominal charge of 10 cents a copy is made to cover cost of handling and postage.

Spherical Roller Bearings

S K F INDUSTRIES, INC., Front St. and Erie Ave., Philadelphia, Pa. Catalogue discussing the application of S K F spherical roller bearings in cranes. The catalogue contains line illustrations showing typical mountings, as well as halftones showing applications in various types of cranes. It gives information on the selection of S K F spherical roller bearings for different loads and speeds, as well as tables of shaft and housing fits and tolerances.

Metal-Cutting Saws

HENRY DISSTON & SONS, INC., 706 Tacony, Philadelphia, Pa. Circular entitled "Disston Solid-Tooth Circular Metal-Cutting Saws—Their Selection and Care." This circular describes the different types of metal-cutting saws, illustrates and describes the types of teeth used in such saws, gives recommendations for speeds and feeds to be used in connection with them, and outlines certain precautions for the proper care of metal saws.

Drop-Hammers and Hydraulic Presses

CHAMBERSBURG ENGINEERING CO., Chambersburg, Pa. Circular containing a reprint of the article "Buick's Modernization Program Effects Forge Shop Economies" from April MACHINERY, which illustrated the use of Chambersburg steam drop-hammers and the Chambersburg hydraulic press. The company is also distributing an "action model" circular, in color, of the Chambersburg slide valve.

Cutting Oils

SUN OIL CO., Philadelphia, Pa. Booklet entitled "Cutting and Grinding Facts," giving data on the cutting oils successfully used on actual operations in the shop for lathe work, milling, boring, tapping, broaching, drilling, cutting off, and grinding. The data given in each case includes operation, machine, material, cutting speeds and feeds, and lubricant. In all, the results of a study of forty-six different operations are given.

Milling Cutters and Tracer Points

PRATT & WHITNEY DIVISION OF NILES-BEMENT-POND CO., Hartford, Conn. Circular 421, containing illustrations and descriptive data, including sizes and prices, covering Pratt & Whitney milling cutters and tracer points for the Keller automatic toolroom machine. A description is included of the Keller cutter grinder used for the proper maintenance of the cutters and tracer points.

Washers and Stampings

WROUGHT WASHER MFG. CO., Milwaukee, Wis., manufacturer of washers, expansion plugs, and stampings, is distributing a new time-saving slide-rule that automatically calculates weight per thousand pieces or pieces per pound of any size washer in any material, including steel, brass, copper, aluminum, fiber, paper, etc. The slide-rule will be sent without charge to those making request on their company letter-heads.

Power-Transmission Equipment

LINK-BELT CO., 2410 W. 18th St., Chicago, Ill. General catalogue No. 1500, containing 208 pages on power-transmission equipment, including anti-friction roller-bearing units; take-ups; "streamline" babbitted bearings; cast-iron and pressed-steel drop-hangers; pulleys of various types; cast and cut tooth gearing; shafting; shaft couplings; safety collars; grease fittings; etc.

Lathe and Drill Chucks

WESTCOTT CHUCK CO., 116 E. Walnut St., Oneida, N. Y. Catalogue 536, illustrating and describing the special features of Westcott lathe and drill chucks, and giving price lists for the different sizes and styles. The chucks covered include universal self-centering lathe chucks, combination lathe chucks, independent lathe chucks, two-jawed lathe chucks, and Little Giant drill chucks.

Trademarks

MIDA'S TRADE MARK & PATENT BUREAU, 537 S. Dearborn St., Chicago, Ill. Booklet entitled "World Trade Mark Laws," containing a digest of trademark laws for 130 different countries. The data, arranged in tabular form, covers rights acquired by registration; duration; who may register; and registration phrase.

Corrosion-Resistant Alloys

COLMONOY CO., Los Nietos, Calif. Bulletin 50, descriptive of Colmonoy alloys and overlay metals which have wear-resistant, corrosion-resistant, and heat-resistant properties. This circular shows different methods of applying these alloys. They are furnished either as overlay metals or in the form of welding rods.

Lathes

LODGE & SHIPLEY MACHINE TOOL CO., Cincinnati, Ohio. Catalogue illustrating and describing the outstanding features of the Lodge & Shipley 12-, 14- and 16-inch lathes. The catalogue includes tables of standard and special ranges of threads, leads, and feeds, as well as tables giving complete specifications.

Chaser-Grinding Fixture

GEOMETRIC TOOL CO., New Haven, Conn. Bulletin E-1, descriptive of the Style E universal chaser-grinding fixture. The booklet includes specific instructions for using the fixture in grinding different kinds of chasers; specifications; and a chaser-grinding chart for die-head chasers and tap chasers.

Lathe Grinders

DUMORE CO., Racine, Wis. Catalogue covering the Dumore line of lathe grinders. The catalogue describes the advantages, special features, and applications of the various types, and includes a table of comparative specifications for external and internal quills and the different grinder models.

Pumps

WORTHINGTON PUMP & MACHINERY CORPORATION, Harrison, N. J. Bulletins W-111-B8 and W-111-B9, illustrating and describing Worthington horizontal single-piston pumps for general service. Bulletin W-423-B3, treating of vertical triplex single-acting power pumps, equipped with Multi-V-Drive.

Grinding Wheels

NORTON CO., Worcester, Mass. Circular illustrating typical examples of the use of Norton grinding wheels for tool grinding; cylindrical grinding; cutting off and slotting; internal grinding; centerless grinding; surface grinding; cemented-carbide grinding; roll grinding; and snagging.

Inclinable Presses

NIAGARA MACHINE & TOOL WORKS, 637-697 Northland Ave., Buffalo, N. Y. Circular 405, describing the new and exclusive features of the Niagara Master A Series, small-size, high-tonnage, inclinable presses with fourteen-point engagement sleeve clutch and built-in single-stroke mechanism.

Materials-Handling Equipment

LEWIS-SHEPARD CO., Watertown, Mass. Bulletin 302, on special lift-trucks, floor trucks, portable elevators, stackers, and special lifting devices for handling tin plate and sheets. Circular 314, showing special stacker and high-tier lift-trucks for handling tin plate and sheets.

Shearing Machines

NIAGARA MACHINE & TOOL WORKS, 637-697 Northland Ave., Buffalo, N. Y. Bulletin 71-F, containing complete specifications on Niagara power squaring shears with capacities for No. 10 gage soft steel and lighter. The circular also points out the special features of these machines.

Lift-Trucks

BARRETT-CRAVENS CO., 3255 W. 30th St., Chicago, Ill. Bulletin 130, illustrating and describing equipment designed especially for the handling of the new low 3 1/2-inch clearance pallets on which tin plate, strip steel, etc., is shipped by manufacturers.

Abrasive Products

NORTON CO., Worcester, Mass. Price list covering standard and special Norbide molded shapes for use wherever a hard wear-resistant material is required under conditions not subject to thermal nor impact shock nor under high temperature in an oxidizing atmosphere.

Solders

ALUMAWELD CO. OF AMERICA, 2442 S. Park Way, Chicago, Ill. Leaflet entitled "A Long Needed Solder for Difficult Soldering Problems," de-

scriptive of Alumaweld solder and flux for soldering aluminum, cast iron, stainless steel, bronze, copper, brass, and other metals.

Flame Cutting Machines

SCHOITZ TOOL, GEAR & MACHINE WORKS, Waterloo, Iowa. Folder illustrating the Schoitz flame cutting machine. Data is included on the relative time taken for cutting out various shapes by flame cutting machines and by ordinary machining methods.

Taps and Reamers

REIFF & NESTOR CO., Lykens, Pa. Catalogue 5, containing complete data, including sizes and prices, on the hand and machine screw taps, nut taps, tapper taps, boiler taps, and hand, chucking, and taper reamers made by this concern.

Power Transmission Appliances

T. B. WOOD SONS CO., Chambersburg, Pa. Condensed catalogue 179, containing specifications, including prices, covering the Universal Giant line of power transmission appliances, including hangers and pillow blocks, couplings, and V-belt drives.

Pilot Switches

PRODUCTION INSTRUMENT CO., 1325 S. Wabash Ave., Chicago, Ill. Bulletin 14, describing the construction and operation of an extremely sensitive pilot switch for use with electric counters and for the control of similar electric circuits.

Precision Hones

SUNNEN PRODUCTS CO., 7900 Manchester Ave., St. Louis, Mo. Circular describing the new Sunnen precision hone for grinding and finishing holes from 0.480 inch to 2.400 inches in diameter and up to 7 inches in length.

Time Recorders

SIMPLEX TIME RECORDER CO., Gardner, Mass. Circular entitled "Accurate Costs without Red Tape Turn Your Losses Into Profits," outlining the advantages and special features of the Simplex time recorder.

Blast Cleaning and Dust Collecting Equipment

PANGBORN CORPORATION, Hagerstown, Md. Circular showing how Pangborn dust collectors save industry thousands of dollars. Several installations of this equipment are shown.

Lubricants

FISKE BROS. REFINING CO., 24 State St., New York City. Circular describing the properties and characteristics of Lubriplate lubricants, which are made in four different series for various applications, as listed in the circular.

Cut-Off Blade Holder

FOUR GRIP TOOL CO., 107 E. 17th St., Paterson, N. J. Supplement to circular No. 9, containing specifications, including prices, for the different sizes of Four-Grip rigid cutoff blade holders.

Cold-Drawn Steel

UNION DRAWN STEEL CO., Massillon, Ohio. Circular illustrating typical examples of steel parts that can be advantageously produced by cold-drawing, and that require no subsequent machining.

Lathes

BOYE & EMMES MACHINE TOOL CO., Cincinnati, Ohio. Bulletin 25, describing in detail the construction of the Boye & Emmes lathes, and giving complete specifications for the nine different sizes in which they are made.

Motors

RELIANCE ELECTRIC & ENGINEERING CO., Ivanhoe Road, Cleveland, Ohio. Bulletins 215 and 216, illustrating and describing Reliance heavy-duty motors for direct current.

Speed Control Equipment

REEVES PULLEY CO., Columbus, Ind. Circular illustrating and describing Reeves variable-speed transmissions, Vari-Speed motor pulleys, and Vari-Speed Motodrives.

Resurfacing Tools

IDEAL COMMUTATOR DRESSER CO., 1214 Park Ave., Sycamore, Ill. Circular describing the eight different grades of "Ideal" resurfacers for motor maintenance work.

Riveting Hammers

CHICAGO PNEUMATIC TOOL CO., 6 E. 44th St., New York City. Bulletin 1946, describing the advantages and special features of the Boyer air-cooled riveting hammers.

Stainless Steels

PETER A. FRASSE & CO., INC., 17 Grand St., New York City. Booklet dealing with the fabrication and treatment of USS stainless and heat-resisting steels.

Portable Air Compressors

INGERSOLL-RAND CO., 11 Broadway, New York City. Bulletin 2198, descriptive of Ingersoll two-stage, air-cooled, electric-driven portable compressors.

Tapping Attachments

CHARLES L. JARVIS CO., Gildersleeve, Conn. Circular listing the improvements, capacities, and prices of the Biax Nos. 0, 1, and 2 tapping attachments.

Die Grinding Tools

ROTOR AIR TOOL CO., 5704 Carnegie Ave., Cleveland, Ohio. Bulletin descriptive of the Rotor air-operated die grinder designed for production service.

Diesel Engines

FAIRBANKS, MORSE & CO., 900 S. Wabash Ave., Chicago, Ill. Bulletin descriptive of Fairbanks-Morse 35-E Diesel engines for rotary drilling service.

Speed Reducers

JANETTE MFG. CO., 556 W. Monroe St., Chicago, Ill. Bulletin 22-5, illustrating and describing five new types of Janette motorized speed reducers.

Plaskon Products

PLASKON CO., INC., 2118 Sylvan Ave., Toledo, Ohio. Circular entitled "Plaskon Parade," illustrating typical products made from Plaskon.

Recording Instruments

ESTERLINE-ANGUS CO., Indianapolis, Ind. Bulletin 436, entitled "How to Make Plant Surveys with Graphic Instruments."

Stamping Dies

MATTHEWS OF NEW YORK, 480 N. Canal St., New York City. Circular descriptive of Matthews "Tuf-Face" stamping dies.

Welded-Steel Trucks

ALL STEEL WELDED TRUCK CORPORATION, Rockford, Ill. Bulletin descriptive of Clark lift-jack units and platform equipment.

Shop Equipment News

Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market

Colonial Broach Co. Develops an Extensive Line of Broaching and Broach-Sharpening Machines

Eleven basic types of broaching and broach-sharpening machines and a total of forty-nine different models have recently been developed by the Colonial Broach Co., 147 Jos. Campau Ave., Detroit, Mich. This line has been designed to cover practically the entire field of broaching, so as to eliminate the need for most machines of special design, with their necessarily high initial cost and low salvage value. The concern will, however, continue to build special machines when exceptional requirements do not permit the use of standard equipment.

Among the unusual features of the line is the ability to readily change the machines over from one size to another to meet production changes. Another feature is the provision for progressive production broaching. For instance, several single-ram machines can be mounted on one base and equipped with continuous-feed fixtures. All machines are a combination of welded-steel and cast-iron construction, and each one is operated by individual motor drive.

Extra large coolant tanks and pumps are supplied, and the machines are so designed that chips cannot accumulate around the work or the tool. In all cases, the machine ways are made of hardened and ground steel and the rams are made of semi-steel. All machines are operated by

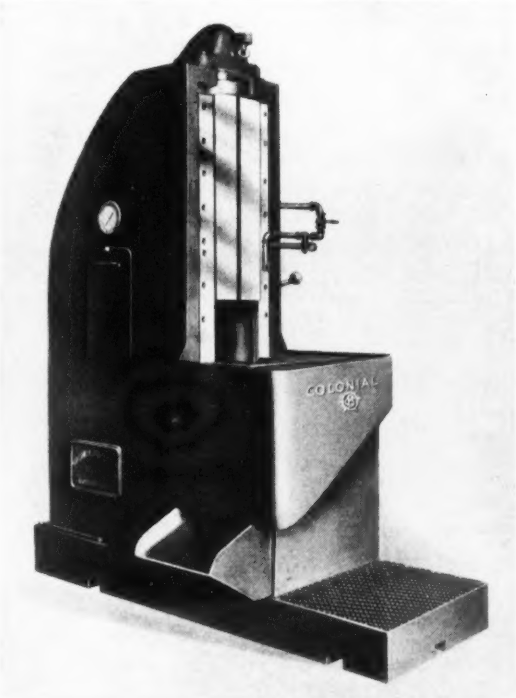


Fig. 1. Colonial Single-ram Surface Broaching Machine which is Built in Eleven Sizes with Capacities of from 6 to 25 Tons

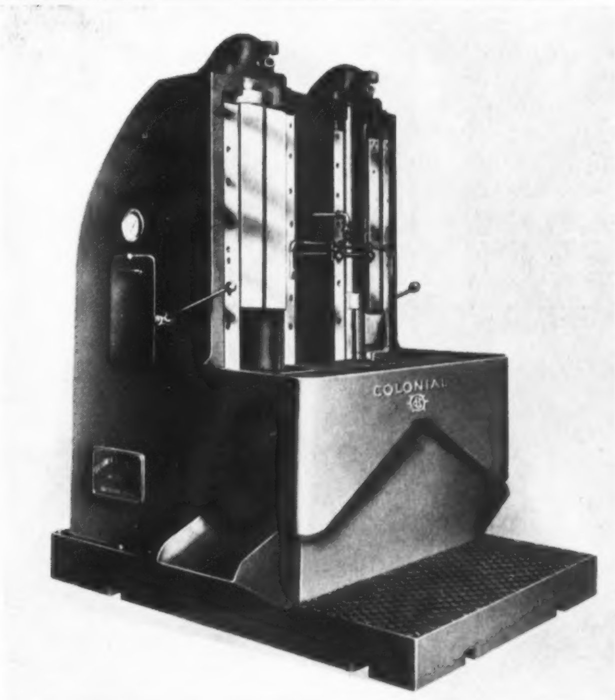


Fig. 2. Dual-ram Surface Broaching Machine which is Equipped with Receding Tables. All Broaching Machines Here Shown are Hydraulically Actuated

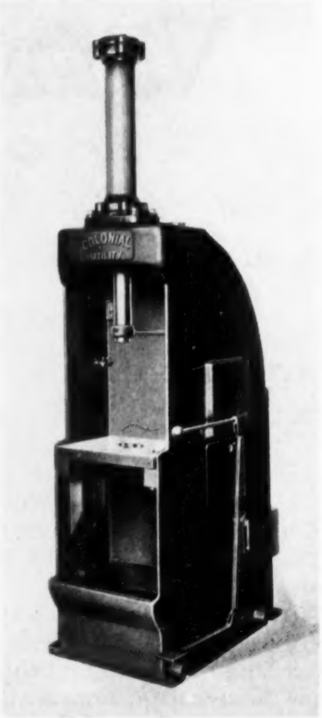


Fig. 3. Vertical Broaching Machine Built in 6- to 15-ton Capacities

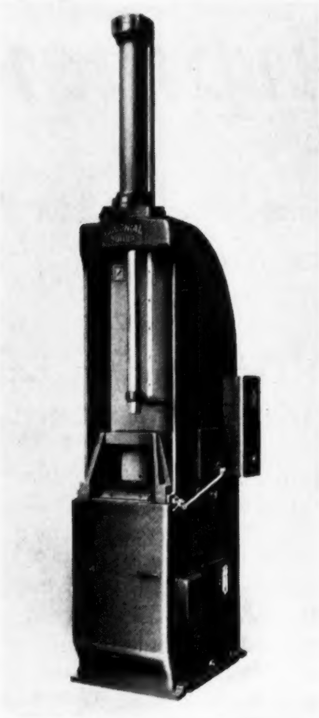


Fig. 4. Broaching Machine Intended for Taking Fairly Light Cuts

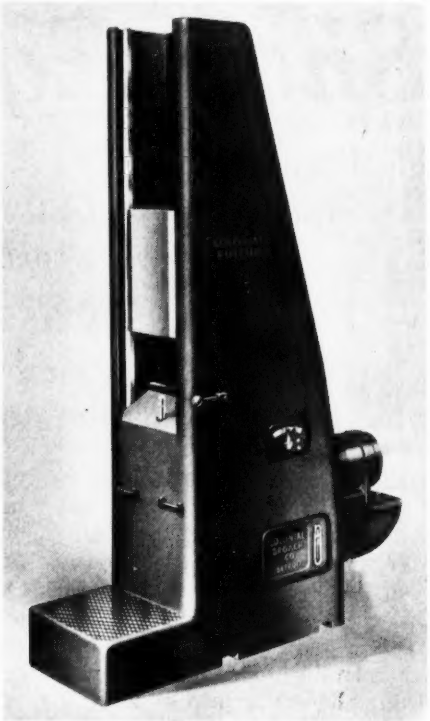


Fig. 5. Heavy-duty "Pullup" Machine for Large Gears, Parts with Long Holes, etc.

hydraulic pumps which provide a pressure of 1000 pounds per square inch. High cutting speeds and fast return speeds are available, and in a number of cases, variable-speed controls are supplied as standard equipment. Automatic lubrication is provided on practically all the different types of machines.

The eleven basic types include single-ram and dual-ram vertical surface broaching machines; high-speed and heavy-duty vertical "Pullup" broaching machines; "Utility" vertical broaching machines; horizontal internal and surface broaching machines; a horizontal high-speed "Pusher" machine for broaching small parts; "Power Presses"; light-duty presses; a surface-broach sharpening machine; and a cylindrical-broach sharpening machine.

The single- and dual-ram vertical broaching machines, which are shown in Figs. 1 and 2, respectively, are available in capacities of from 6 to 25 tons,

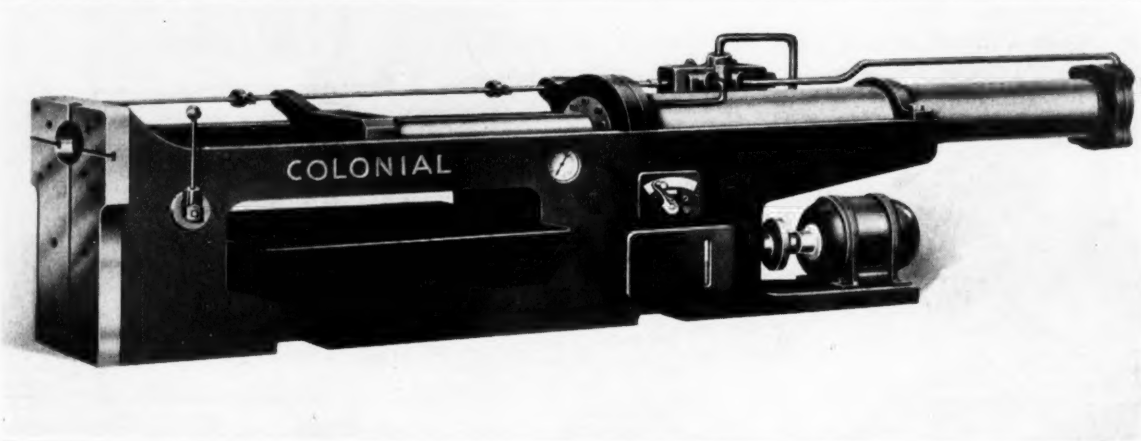


Fig. 6. Horizontal Pull Type of Machine Designed for Both Internal and Surface Broaching

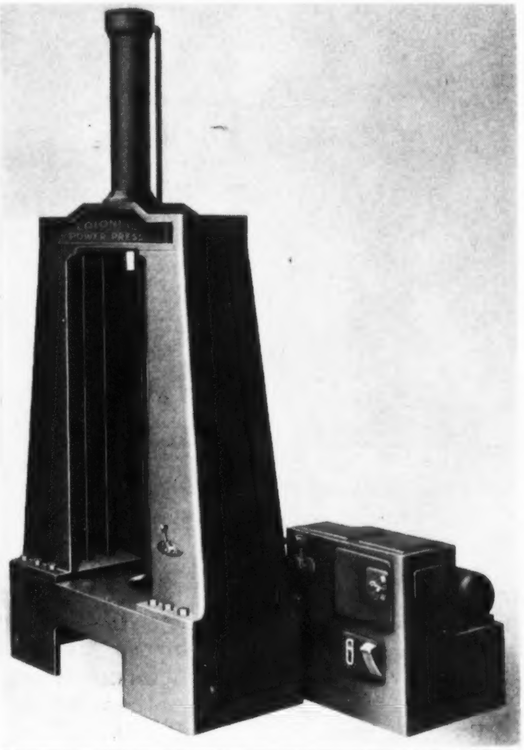


Fig. 7. "Power Press" Designed for Internal Broaching and for External Broaching of Surfaces up to 2 Feet Wide

with a stroke of from 36 to 60 inches. Surface broaches having a maximum width of 13 1/2 inches can be accommodated by these machines. The "Utility" broaching line is available in from 6- to 15-ton capacities, with strokes of 24 and 36 inches. One of these machines is illustrated in Fig. 3.

The high-speed vertical "Pullup" machine illustrated in Fig. 4 is available in three models ranging in capacity from 6 to 15 tons, with a standard stroke of 36 inches. These machines are designed for the high-speed production of bushings, internal gears, and other work on which fairly light cuts are to be taken. They are also especially adaptable to short runs because of the convenience with which change-overs can be made. The ram of this machine is of the pull type, and broaching is performed altogether automatically without requiring the operator to handle the broach. The cutting speed is at the rate of 30 feet a minute and the return speed at the rate of 60 feet a minute.

The heavy-duty vertical "Pullup" series of machines is complementary to the high-speed "Pullup" machines, but is intended for heavy-duty broaching on large gears, work with long holes, etc. These machines are built in capacities of from 10 to 20 tons, with a stroke of either 48 or 60 inches. The general construction may be noted in Fig. 5. The variable cutting-speed control incorporated in these machines provides increased flexibility of operation to suit a wide range of parts.

Universal pull types of horizontal broaching machines intended for both internal and surface broaching operations are built in six models ranging from 6 to 20 tons in capacity and having strokes of 48 or 60 inches. This group of machines, one of which is shown in Fig. 6, is particularly adapted to the broaching of keyways and of round and splined holes. The faceplate capacity is such that the machines can accommodate a wide range of surface broaching fixtures with tools up to 10 inches in over-all width. The standard cutting speed is 30 feet a minute, a variable-speed control also being standard equipment. The return stroke is at the rate of 60 feet a minute.

Fig. 8. Light-duty Press Intended for Broaching and Assembling Operations

Fig. 9 shows the high-speed "Pusher" type of machine which is especially suited for continuous production of small parts

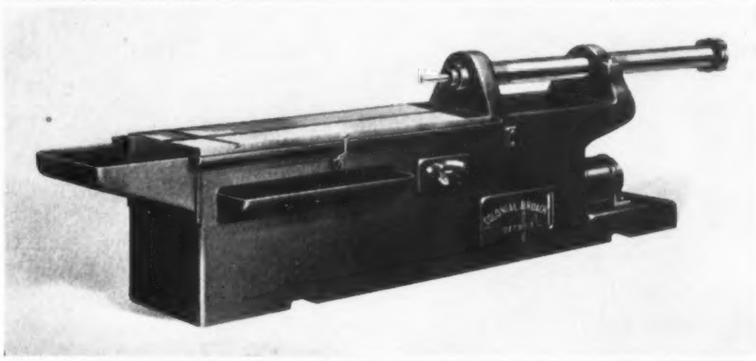


Fig. 9. High-speed Machine Designed for Continuous Production of Small Parts; it May be Equipped with Magazine Feeds

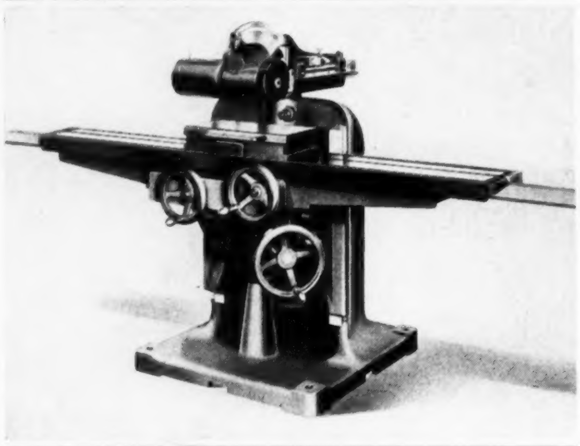


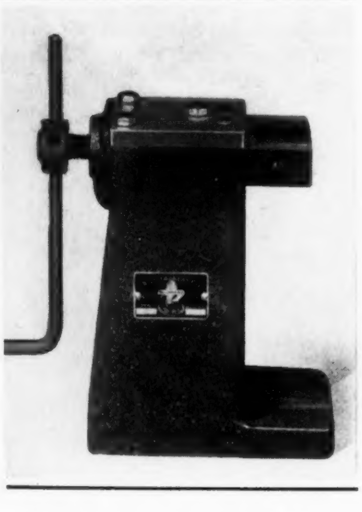
Fig. 10. Machine Designed for Sharpening Surface Broaches

Fig. 11. Cylindrical Broach Sharpening Machine of Improved Design

such as are used in washing machines, typewriters, and automobiles. It is designed to accommodate magazine feeds, so as to obtain high-speed production with minimum attention on the part of the operator. This machine is built in a 6-ton model with a standard stroke of 36 inches.

Double-column "Power Presses" of the construction illustrated in Fig. 7 are built for the internal broaching of large gears or similar parts and also for taking surface broaching cuts up to 2 feet in width. These machines are available in any capacity, with virtually any length of stroke. When light shaving cuts must be taken with surface type broaches, when small keyways are to be broached, or when bushings or other parts are to be pressed together, light-duty presses of the style shown in Fig. 8 can be supplied in capacities of from 1 to 4 tons. All models of this series have an 18-inch broach.

The broach-sharpening machine illustrated in Fig. 10 is designed for surface broaches, while that shown in Fig. 11 is intended for cylindrical broaches. Both machines are designed to overcome difficulties encountered in grinding the under-cut on broach teeth. The manufacturer claims that these machines make possible a two-thirds reduction in the broach-sharpening time of many plants.



Haskins Tapping and Drilling Fixture

Haskins Tapping and Drilling Fixture

To meet the increasing demand for accuracy in high-speed tapping and drilling, as well as in such operations as countersinking, counterboring, etc., the R. G. Haskins Co., 4634 W. Fulton St., Chicago, Ill., has developed the vise fixture here illustrated. The three-point contact jaws are made of hardened tool steel. Five combinations of jaws for handling round stock from 3/16 to 1 inch in diameter are available. The fixture handle can be adjusted to any position and requires only a 30-degree movement for releasing the work. The base is provided with a T-bolt and slot for mounting the fixture on the machine table.

Oliver 18-Inch Metal-Cutting Band Saw

An 18-inch band saw adapted for sawing sheet steel and other sheet metals, rods, and tubing has been placed on the market by the Oliver Machinery Co., Grand Rapids, Mich. This machine can be used for cutting hard rubber, wood, and various compositions, and for cutting sprues from soft metals.

The machine is similar in appearance to the 18-inch wood-cutting band saw made by this company. The new machine differs from the older wood-cutting machine, however, in that it is equipped with bearings that are fully enclosed and protected against particles of metal; also, the motor is fully enclosed, air-jacketed, and fan-cooled and develops 1 horsepower instead of 1/2 horsepower. The metal-cutting saws run at a speed of 1200 revolutions per minute, whereas the woodworking saw operates at a speed of 900 revolutions per minute.

Fellows "Red Liner" for Checking Hourglass Steering Worms

A Red Liner machine for checking hourglass steering worms has recently been designed by the Fellows Gear Shaper Co., Springfield, Vt. This machine indicates the amount of clearance between the worm and sector or roller on charts having index lines for each quarter revolution of the worm, as shown in Fig. 4. The machine, shown in Fig. 1, operates on the same principle as the regular type Red Liner made by this company for use in checking external and internal gears. The new machine, however, is intended for hand operation only, and is arranged with a 40 to 1 magnification for English measures and a 50 to 1 magnification for metric measures.

A close-up view of an hourglass worm being checked and the master roller employed in checking is shown in Fig. 2. Fig. 3 shows how the sector or master roller carrier is centralized with the worm to be tested. A ball-point plunger held in the carrier is brought in contact with both sides of the worm thread, in order to set the carrier in the correct position for both angle and center distance. An electric light in the cabinet provides illumination for making this setting and for inspecting the contact of the worm and sector teeth or roller. Two size blocks are employed in making the setting. One of the blocks, shown in the illustration, is used to set the carrier to the correct angle. The other block (not shown) is located at the rear of the machine, where it is used for setting the carrier to the correct center distance between the hourglass worm and its sector.

The chart, shown in Fig. 4, indicates the amount of clearance between the work and the master roller or sector for each quarter revolution of the worm. It shows that the clearance between the worm and sector tested increases rapidly after the worm makes one complete revolution. This rapid increase in the clearance is provided to avoid any possibility of the roller or sector binding in the worm at the extreme ends thus preventing proper operation.

In operating the Red Liner, the sector or roller holder is first set to the correct center distance and angular position by means of the size blocks. When a master sector is employed, the graduated dial is rotated 180 degrees to give the required setting.

In checking a worm, it is necessary to start either at one end of the worm or the other, depending upon the direction or hand of the helix. The sector holder carrying the master roller or sector is elevated and moved to the end of the worm. It is then lowered to engage the worm. The crank-handle on the graduated dial is next rotated in a clockwise direction until the roller reaches the opposite end of the worm. With a 40 to 1 magnification, the distance be-

Fig. 1. Fellows Red Liner Designed Especially for Checking Hourglass Steering Worms

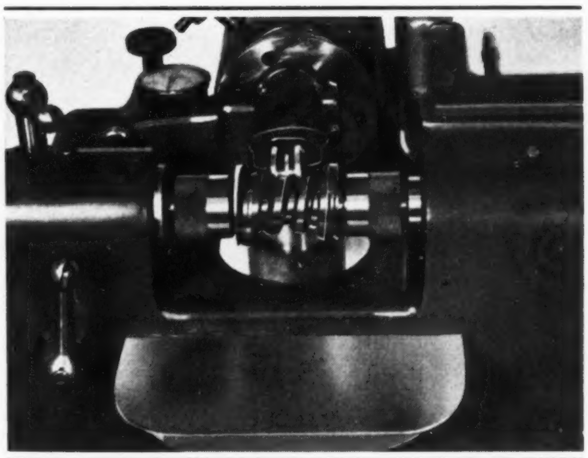


Fig. 2. Close-up View of Hourglass Worm Undergoing Clearance Test in Machine Shown in Fig. 1

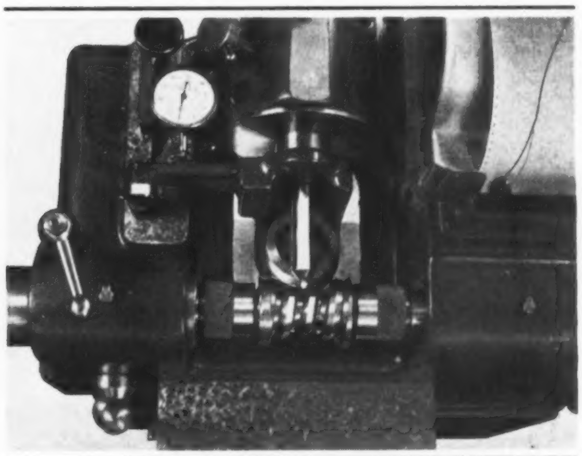


Fig. 3. Arrangement for Setting Master Roller on Red Liner for Testing Hourglass Worm

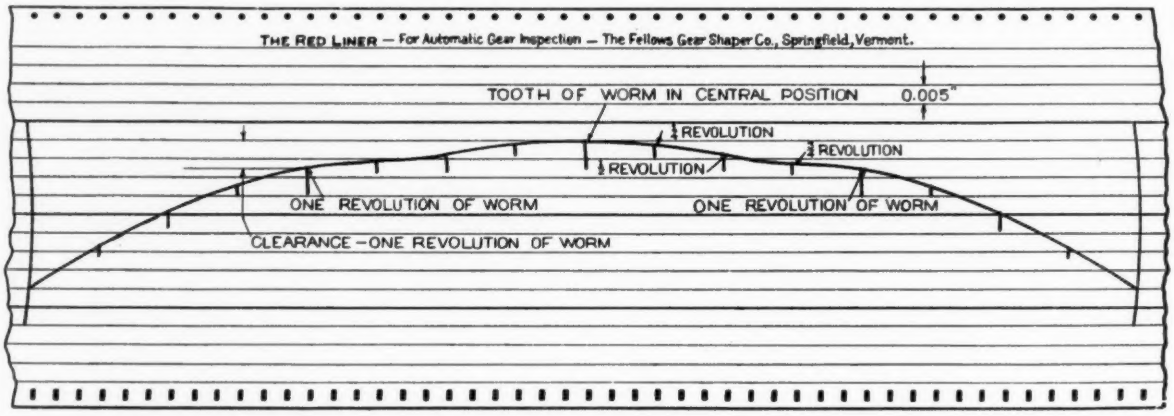


Fig. 4. Typical Red Liner Chart Made in Checking Hourglass Steering Worm

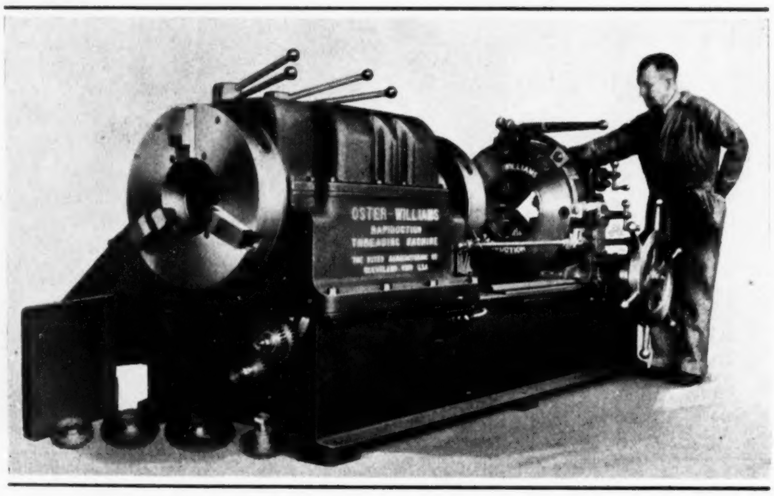
tween the lines on the chart, as shown in Fig. 4, represents 0.005 inch. For metric measure with a 50 to 1 magnification, this distance represents approximately 1 millimeter. The machine has a maximum capacity for testing worms having a pitch of 3 inches, which covers practically all sizes used for automotive steering devices and applications of a similar nature.

Oster "Rapiduction" Pipe Threading and Bucking-Up Machine

A machine of heavy construction designed for threading and bucking-up work on all sizes of pipe from 2 1/2 to 8 5/8 inches, which is known as the No. 8-XHD "Rapiduction," has been brought out by the Oster Mfg. Co., 2057 E. 61st Place, Cleveland, Ohio. All shafts in this machine are mounted in Timken roller bearings. The clutch is of the double-action friction type which permits changing directly from a low to a high speed or from a high to a low speed without shifting gears. More than 30,000 foot-pounds torque can be exerted at the chucks for bucking-up tool joints, fittings, and flanges.

The two clutch speeds and the regular transmission give a range of spindle speeds from 3 to 87 revolutions per minute. One set of chuck jaws covers the range of pipe sizes from 2 1/2 inches inside diameter to 8 5/8 inches outside diameter. The die-head handles the full range of sizes with only one set of chasers for each pitch. High-speed steel cut-off, reaming, and chamfering tools are mounted on the rear of the die-head.

The carriage has a maximum travel of 28 inches. The carriage lead-screw and gears provide for cutting 8, 10, 11 1/2, and 14 threads per inch. A taper attachment is provided for 3/16-, 3/8-, and 3/4-inch tapers. The attachment is also furnished for cutting tapered threads for oil-field equipment.



Oster "Rapiduction" Pipe Threading Machine

Goodrich "Hipress" Air Hose

An air hose designed for all types of pneumatic tool applications has been brought out by the B. F. Goodrich Co., Akron, Ohio. This hose, known as the "Hipress," is of combination construction, the inner portion consisting of four plies of specially woven duck, while the outer part is made up of tightly braided high-tensile cords which are applied with a tension ten times that normally used on long lengths of braided hose. Between the inner and outer portions is a substantial insulation which serves as a tube to prevent air from penetrating the walls of the hose and to protect the outside. This hose is made in lengths up to 500 feet, and in 1/2-, 3/4-, and 1-inch sizes.

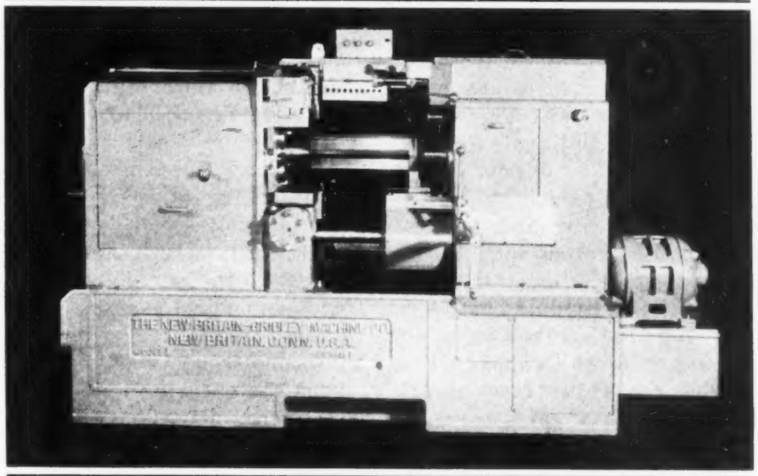


Fig. 1. Maximum Tool Accessibility and Chip Space are Features of a Line of New Britain Model 61 Automatic Screw Machines which are Available with Four or Six Spindles

New Britain Automatics Designed for Maximum Tool Accessibility and Chip Clearance

The success of the Models 40 and 41 automatic screw machines placed on the market about a year ago by the New Britain-Gridley Machine Co., New Britain, Conn., has led to the development of a line of Model 61 machines which are designed on the same principles, but which are constructed in both four- and six-spindle styles and for larger work. There are three six-spindle machines which have a capacity for bars up to 1 5/8, 2, and 2 1/4 inches, respectively, and two four-spindle machines which have a capacity for bars up to 2 5/8 and 3 inches diameter.

In designing this new line, particular attention was paid to providing maximum tool accessibility and maximum chip space. These objectives have been obtained by the provision of an extra wide base and pan, by an improved arrangement of the cross-slides, and by locating all operating mechanisms clear of the chip space. The roughing spindles are in the lower positions of the machine, thus preventing the heavy chips from interfering with the efficiency of the finishing tools. To insure permanent accuracy, the headstock, base, and power box are rigidly bolted and doweled together. In addition, an overhead member ties the headstock and the power box rigidly together.

The spindle carrier is of extra large diameter and is finished to close limits to suit the use of

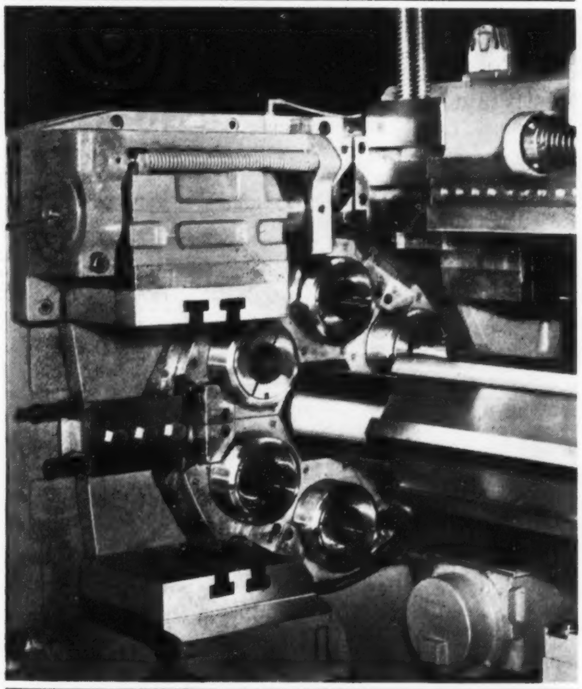


Fig. 2. Close-up View of the Spindle Carrier of a Six-spindle Machine and of the Carrier Stem and Tool-slides

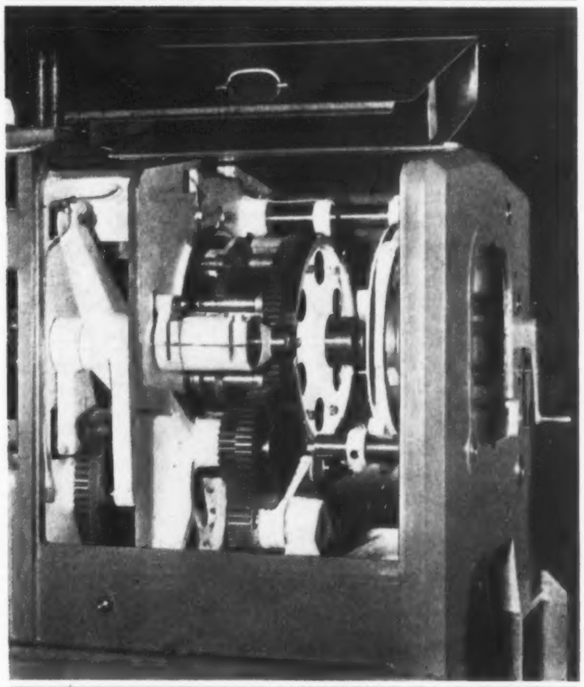


Fig. 3. The Spindle Carrier Mechanism and the Other Units of the Machine are Made Accessible by Simply Raising Sheet-metal Guards

preloaded ball-bearing spindle mountings. The same mechanism that was employed in the Nos. 40 and 41 models for lifting the spindle carrier prior to each indexing, so as to eliminate wear on its seat, is retained in the new line of machines. Indexing of the spindle carrier is accomplished through a modified Geneva motion. The clamping of the carrier after each indexing is completed eliminates all tendency for it to weave during the cutting cycle and also insures accurate location. The automatic lifting feature insures permanent alignment between the spindle carrier and the main tool-slide. The spindles are short in length and are mounted in preloaded ball bearings, which eliminates all radial and axial deflection, even under heavy tool pressures.

The main tool-slide is hexagonal on the six-spindle models, and square on the four-spindle models. It reciprocates on a hardened stem which is practically integral with the spindle carrier. The cam for operating the main tool-slide is enclosed and yet is readily accessible for change overs.

Three main forming slides are mounted on cylindrical hardened and ground steel studs, supports for which are cast on the base and headstock. The face of each slide is guided in its cross travel between hardened and ground ways which insure a straight-line travel. The cut-off slide and the optional forming slide in the No. 5 position of the six-spindle models are of the flat type and are hardened and ground. Each cross-slide has an independent motion, obtained through its individual cam. The cams for the cross-slides are mounted on disks located just in back of the front face of the headstock. These cams are made quickly accessible by removing guards. As only one screw locks each cross-slide cam in position. cams can be changed within a few minutes. Accelerated tools, such as reamers, taps, or other tools requiring motion independent of the main tool-slide can be used in the Nos. 4, 5, and 6 positions.

The stock feed mechanism is of the spring and cam-operated type. An electrical device stops the machine when the stock is exhausted in any spindle, with that spindle in the loading position and with its collet open. At the same time, a signal light warns the operator that the machine needs attention. An automatic chip conveyor can be provided for transferring the chips to a separate pan beneath the stock reel.

Adaptations of Heald Grinding Machines

Grinding machines built by the Heald Machine Co., Worcester, Mass., can be equipped with a magnetic chuck, as illustrated in Fig. 1, to adapt standard machines for general tool-room work, especially punch and die grinding. The application of such a chuck to the regular work-spindle makes a machine practically universal, as the work can be so mounted as to permit internal, external, and face grinding on both straight or tapered work. The work-head is provided with a hand-operated cross-slide.

In Fig. 2 a Heald surface grinding machine is shown equipped with a shelf in front of the chuck so that the work, which reaches the machine on a conveyor at the same height as the shelf, can be conveniently slid on the shelf and then on the magnetic chuck. A hinged guard is provided, which can be raised and lowered to facilitate loading and unloading of the work pieces.

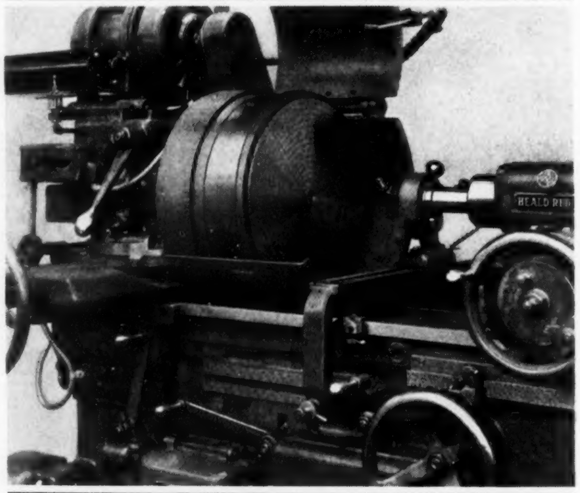


Fig. 1. Heald No. 70 Grinding Machine Equipped with a Magnetic Chuck that Adapts the Machine to General Tool-room Work

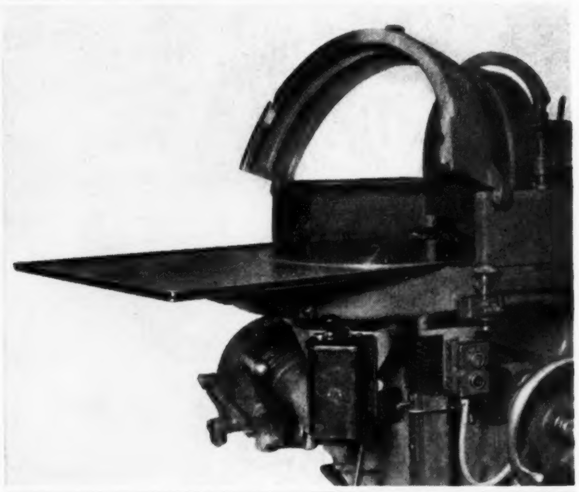
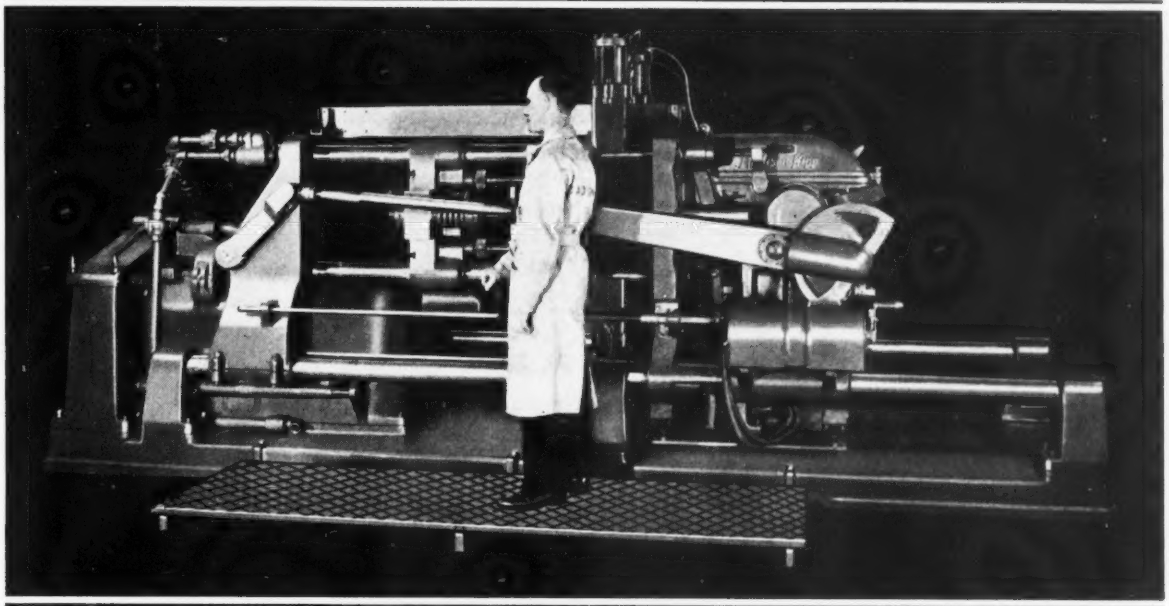


Fig. 2. A Shelf Mounted at Conveyor Height in Front of the Chuck on This Machine Facilitates Loading and Unloading of the Work



Madison-Kipp Automatic Die-casting Machine Designed for Dies Up to 22 1/2 by 28 1/2 Inches

Madison-Kipp Automatic Die-Casting Machine of Unusually Large Size

What is believed to be the largest automatic die-casting machine ever built is being introduced on the market by the Madison-Kipp Corporation, 203 Waubesa St., Madison, Wis. This machine is designed normally to accommodate dies up to 22 1/2 by 28 1/2 inches. The effective capacity of the standard direct air-pressure gooseneck is 25 pounds of zinc alloy, but larger goosenecks of the same type can be applied, as well as goosenecks of the plunger type. The metal pot has a capacity for 1200 pounds of zinc alloy. The machine is 17 feet long by 6 feet wide by 7 feet high, and it weighs about 30,000 pounds.

This No. 8 machine is ordinarily arranged for operation at the rate of 1.66, 2.5, 3.33 and 5 shots per minute, but other speeds of operation can be obtained by simply changing the motor drive gears. The machine is designed on the same general principle as the Nos. 4 and 5 machines. The reciprocating action, which opens and closes the dies and which provides the desired period of dwell for "shooting" the casting, is obtained through the use of the patented crank-cam units which are standard equipment on the other automatic machines of this company's manufacture.

The cross-head of this machine is equipped with four air cylinders to which wedges are attached, so that the machine can be used for producing exceptionally large castings that are normally considered beyond its capacity. When the movable die carriage is brought into the closed position, these wedges automatically drop over the four die-carriage guide rods to insure solid locking of the carriage. In addition, the machine is equipped with standard locking bars.

The movable and stationary die plates have standard mounting provisions for the dies, and arrangements are included for mounting automatic ejector mechanisms. The patented Madison-Kipp automatic core-pulling devices can be applied. The combination bars to which the core-pulling cams are attached may be placed in various positions on top of the machine and two or more combination bars can be used at the same time.

The operating cycle of the machine from the open position to the ejection of the casting is entirely automatic. This means that the dies are closed, the cores moved into position, the gooseneck loaded with metal and brought up to the dies, the casting "shot," the pressure exhausted, the dies opened, the cores withdrawn, and the casting ejected, all with the movement of one operating lever which engages the clutch.

Speedway "Flea Power" Motor

A motor only 2 1/2 inches in diameter, equipped with a worm drive and back-gears, which is made in alternating current, direct current and universal types, has been added to the line of "Flea Power" motors made by the Speedway Mfg. Co., 1834 S. 52nd Ave., Cicero, Ill. The unit is so designed that it can be assembled with the drive shaft to the right, to the left, or in the up or down positions.

The unit can be furnished with gears to give various drive-shaft speeds of from 1 to 80 revolutions per minute. It measures 2 1/2 by 3 by 4 inches.

New Features of "Do-All" Machines

A power work feed, an arrangement for circle-cutting flat stock up to 8 inches in thickness, and a magnifying glass for use in precision sawing with narrow-blade saws are features recently incorporated in the "Do-All" machine made by Continental Machine Specialties, Inc., 1301 S. Washington Ave., Minneapolis, Minn.

The method of using the power feed is shown in Fig. 1. The feeding power or pressure is delivered by a spring motor provided with a heavy coil spring. One of the spring motor units is shown in the lower right-hand corner of the illustration to give some idea of its size and approximate position within the machine cabinet. A constant pressure of 50 pounds is delivered by the motor unit, but the "pull" is controlled by a foot-pedal which permits regulating or instantly releasing the pressure. This foot control leaves both of the operator's hands free to guide the work.

The device used for inside and outside circle cutting is shown in Fig. 2. It consists of a plate or slide set into the work-table which has a series of tapped holes that accommodate center pivots. Disks or circles are cut by revolving the work on one of the center pivots. The plate or slide can be adjusted in the slot for cutting disks of any desired diameter.

The magnifying glass shown in Fig. 1 is particularly useful in performing intricate operations with narrow-blade saws. The glass has a magnification of approximately three times, and is of sufficient size to permit viewing the work with both eyes.

Monarch Hydraulic Multi-Speed Lathes

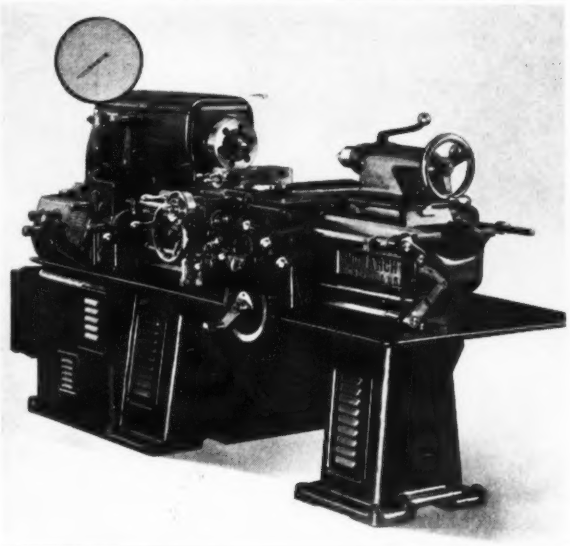
Lathes in 5, 10, 15, and 20 horsepower sizes built by the Monarch Machine Tool Co., Sidney, Ohio, are now being furnished with hydraulic multi-speed drives that provide any desired range of spindle speeds. The number of speeds instantly available within the range is practically limitless. Only one set of helical back-gears is used to secure speeds slower than 100 to 200 revolutions per minute. No gearing is employed for the faster speeds. The machines are standard, except for the headstock and cabinet leg.

The illustration shows a 12- by 30-inch Model C tool-room lathe equipped with a hydraulic multi-speed drive. The five-horsepower constant-speed electric motor, together with all the hydraulic equipment, is housed inside the specially designed headstock leg.

This lathe has a 5 to 1 helical back-gear unit which runs in oil and is controlled by a single lever on the front of the headstock. A tachometer with a 12-inch dial shows the spindle revolutions per minute and the surface cutting speed, in feet, for various diameters. All spindle speeds are secured manually from the operator's position at the apron. Tachometers with dials of different sizes can be furnished. A dial 4 1/2 inches in diameter is used when only

Fig. 1. "Do-All" Machine Equipped with Power Work Feed

Fig. 2. Cutting Disks from Flat Stock on "Do-All" Machine



Monarch Tool-room Lathe Equipped with Hydraulic Multi-speed Drive

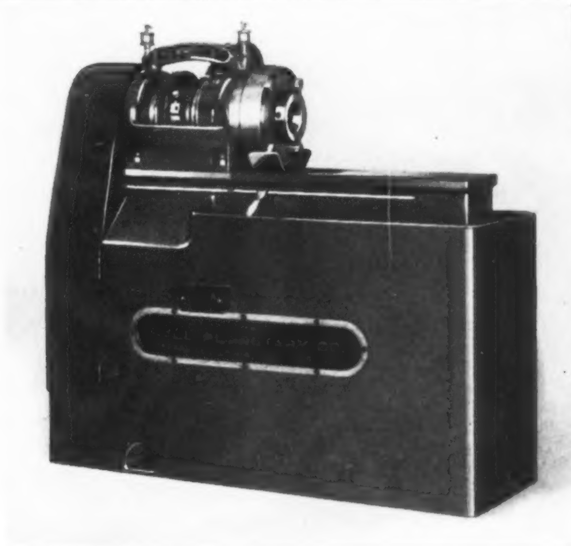


Fig. 1. Planetary Machine Milling External and Internal Threads at the Same Time

the number of spindle revolutions per minute is required.

On production jobs where the diameter being turned changes constantly, the lathe is fitted with an automatic speed control attached to the tool-slide, so that the desired surface cutting speed is secured automatically.

"Smootharc" Welding Electrodes

A line of coated rods for direct-current welding, known as "Smootharc," is now being made and sold through the Harnischfeger Corporation, 4536 W. National Ave., Milwaukee, Wis. These rods or electrodes are designed primarily to speed up welding operations with a smoother, more easily handled arc, and to reduce spatter losses. The present line includes five different types with both high and low rates of fluidity for various types of work, including welding in flat, vertical, or overhead positions and with ferrous and nonferrous metals.

Service tests of welds made with various types of rods ranging from 3/32 to 3/8 inch in size show tensile strengths ranging from 55,000 to 75,000 pounds per square inch.

Hall Planetary Machine for Milling External and Internal Threads Simultaneously

Threads can be milled externally and internally at the same time on work pieces by a Model B thread- and hole-milling machine now being introduced on the market by the Hall Planetary Co., Fox St. and Abbotsford Ave., Philadelphia, Pa. One of the threads may be right-hand and the other left-hand, or they may be of the same hand. The threads may be of the same or different pitch and either straight or tapered. This feature of the machine has been made possible by the provision of a gear-change attachment known as the "Universal Thread Master."

This attachment is driven by spur-gear teeth on the periphery of the spindle container. These teeth engage change-gears which, in turn, revolve a master nut having ten threads per inch. By simply changing gears, right-hand threads from 1 to 40 per inch may be cut, while with the provision of an idler gear, left-hand threads of the same pitches may be milled. The different thread pitches are obtainable with one master nut. Threads of U. S. Standard, Acme, Whitworth, or any other form that can be milled can be cut on this machine.

In cutting an internal right-hand thread at the same time as an internal left-hand thread, or vice versa, the feed of the milling cutter for the internal thread is advanced or retarded, as required, through the use of a second master nut at the back of the machine.

Another feature of this machine is the design of the exterior. There are no moving parts on the outside, with the exception of one starting lever, and all surfaces are smoothly designed to avoid projections. Even the cover plates are sunk into the machine to make them flush. The main motor and its drive are located in the left-hand end directly under the planetary head. The complete drive, together with the coolant pump, is made accessible by simply opening two large doors.

The whole machine is constructed of several sub-assemblies—the head, the gear-case, the power plant which includes the motor for driving the gearbox and the head, and the hydraulic unit. Any sub-assembly can be removed from the ma-

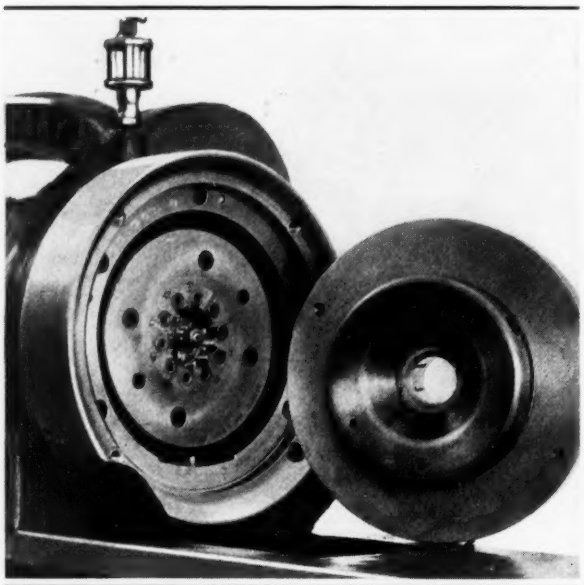


Fig. 2. Cutter-head for Milling External and Internal Threads Simultaneously

Fig. 3. The Attachment in which Gears are Changed to Obtain Any Thread Pitches

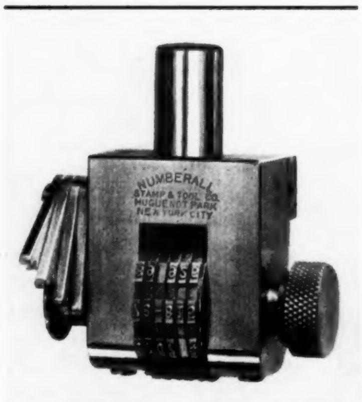
chine within one minute. For instance, the gear-case slides under the head in the same manner as a drawer, and can therefore be quickly removed and put back. Either hand, air, or hydraulically operated chucks may be used.

The reservoir for cutting compound is in the center of the bed. The pump which delivers the compound to the milling cutters is turned on and off automatically when the work is being unloaded and loaded. The cutter-arbor of this machine is designed to bear only on the inner and outer ends, and consequently cannot rock.

Like all other Planetary machines, this model is so designed that the work-holding fixtures can be attached directly to the planetary head or mounted on the ways. In the illustrations shown, the machine is equipped with a work-holding attachment for a simple tubular piece. An external right-hand thread 1 1/2 inches in diameter having 16 threads per inch is being milled on this piece at the same time as an internal left-hand thread 1 1/8 inches in diameter having 12 threads per inch. The estimated production on this operation is 120 pieces an hour.

Numbering Stamp with Quick-Change Feature

The Numberall Stamp & Tool Co., Inc., Huguenot Park, Staten Island, N. Y., has recently brought out an inexpensive multiple numbering tool that was designed specifically to enable numbers, letters, or other characters to be changed rapidly between successive strokes of the press on which it is used. Even though the numbers are changed by hand, it is claimed that in consecutive and in repetitive numbering of metal products, approximately 5000 pieces can be marked in an eight-hour day.



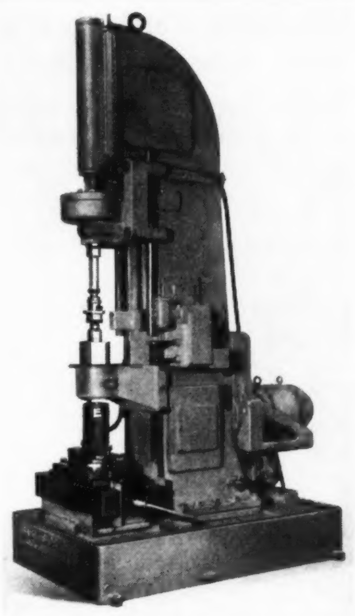
Numbering Stamp Designed for Rapid Changing of the Numbers

This stamp is made with six index-wheels provided with numbers around their periphery, but any number of wheels up to twenty could be provided, and letters or other characters, as well as numbers, could be furnished on the wheels. To index any wheel so as to change one of the figures being stamped, the operator merely turns the knurled-head screw on the right-hand side of the device, after first swinging down the leaves on the left-hand side to permit sliding the indexing device in or out, so as to position it according to the wheel to be indexed. These settings can be made almost instantly.

The letters or figures on the wheels can be furnished in flat- or sharp-face styles and in various sizes from 1/32 to 3/4 inch in height. Direct-reading figures or letters can be provided in the spaces between the stamping characters, so that the operator, by looking at the front of the tool, can read the exact number that will be produced with any setting of the characters at the bottom of the index-wheels. This stamping tool can be furnished with various sizes of shanks.

Barnes Drill Co.'s Full-Hydraulic "Fluid Speed" Honing Machine

Cylinders from 3 to 10 inches in diameter can be honed in a No. 2610 full-hydraulic honing machine with variable-speed transmission being introduced on the market by the Barnes Drill Co., 814 Chestnut St., Rockford, Ill. The reciprocating strokes of the spindle are adjustable from 1 to 20 inches. Any reciprocating speed from 0 to 80 feet a minute is obtainable. The rate of reciprocations and the spindle speeds can be changed simultaneously or independently by means of controls on the left-hand side of the column.



Hydraulic Honing Machine for Cylinders from 3 to 10 Inches

One of the features of this machine is the provision of a ball-bearing carriage for the spindle instead of the conventional sliding head. The carriage ball bearings run directly on hardened and ground vertical shafts which serve as tracks. The bearings are so mounted as to always be in contact with the tracks and to secure the carriage to the machine. The spindle runs in Timken tapered roller bearings. It is short in length and is driven through a vertical multiple-spline shaft and helical gears. A tachometer mounted on the carriage shows the spindle speed being obtained with any setting of the variable-speed transmission.

The hydraulic cylinder is mounted in the upper housing of the machine with its piston-rod connected direct to the spindle carriage. On the right-hand side of the cylinder, as may be seen in the illustration, is an air counterbalance which is also connected to the spindle carriage. The upper of the horizontal control levers on this side of the machine is used to obtain short spindle strokes for removing taper or high spots in bores being honed. The lower horizontal lever controls a stop that provides automatic lift-out at the end of an operation.

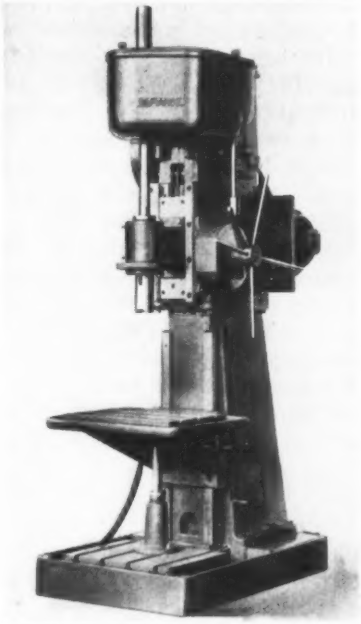
The illustration shows this new honing machine equipped for honing Diesel engine sleeves having bores 5 3/4 inches in diameter by 15 inches long. The hone is of the automatic type (manufactured by the Micromatic Hone Corporation, Detroit, Mich.). One motor of from 10 to 15 horsepower, according to the size of the work, and running at a speed of 1200 revolutions per minute operates the entire machine, with the exception of the coolant pump, for which a separate small motor is provided.

The over-all height of the regular machine is 11 feet 7 inches; the distance from the center of the spindle to the face of the column, 13 1/4 inches; maximum distance from top of table to nose of spindle, 56 1/2 inches; maximum distance from finished surface of base to nose of spindle, 69 3/4 inches; and minimum distance from top of table to nose of spindle, 11 inches. These dimensions can be changed through the provision of special columns.

Defiance Production Drilling Machine

A No. 200 production drilling machine designed primarily for single-purpose operation has been brought out by the Defiance Machine Works, Defiance, Ohio. Although particularly adapted for continued operation in production lines, this machine is sufficiently flexible for general-purpose use.

Gears with splined holes, which are interchangeable on the upper ends of four vertical splined shafts, comprise the feed train. These gears give sixteen feeds ranging from 0.006 to 0.037 inch per revolution of the spindle. Two series of spindle speeds are available. One group has a range of 97 to 564, and the other a range of 66 to 383 revolutions per minute.



Production Drilling Machine built by the Defiance Machine Works

Multiple-spindle heads may be attached to the lower side of the spindle bearing housing. Additional weight may be added to the counterweights to compensate for these heads. A graduated dial is provided for setting the clutch to disengage the feed

at any desired point. Offset blocks may be bolted between the head and the column to increase the distance between the spindle center and the column face.

Special columns may also be supplied for assembling two or more heads to form a gang drilling machine. The drive may be by belt to a single pulley, by V-belts from a motor attached to the bracket on the frame, or by a silent chain.

The machine can be arranged for hand feed tapping operations by providing a reversing motor. An auxiliary feed-box and gears for power lead-screws can also be supplied for use in tapping. Holes up to 2 inches in diameter can be drilled in steel with high-speed drills.

Oilgear 300-Ton Vertical Press

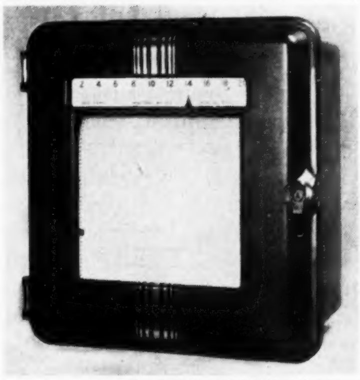
A ram approach speed of 195 inches per minute and a return speed of 260 inches per minute are obtainable on a 300-ton press of welded-steel construction recently brought out by the Oilgear Co., 1310 W. Bruce St., Milwaukee, Wis. A pressing speed which is adjustable up to 15 inches per minute is obtainable. The return speed can also be adjusted to suit the work.

When the foot-pedal is depressed, the cross-head approaches the work rapidly, and automatically slows down to the pressing speed when the work is reached. The ram continues downward until maximum tonnage or positive stops are reached and will maintain full tonnage on the work until the operator releases the foot-pedal. The cross-head then travels upward at the rapid traverse speed and stops automatically.

A hand-lever on the side of the press can be used to lock the control in the pressing position, so that full tonage can be exerted continuously without requiring the operator to keep his foot on the pedal. When maximum pressure is exerted, the automatic unloading control reduces the pump stroke to a point just sufficient to maintain maximum pressure in the system. All control mechanism is concealed in the press frame.

Fluid power operation is provided by an Oilgear pump directly connected to a 20-horsepower electric motor operating at a speed of 1140 revolutions per minute. Both the pump and the motor are mounted on the oil reservoir, which is welded to the top and back of the frame. The automatic unloading control is adjustable, so that the maximum press tonnage can be varied from 60 to 300 tons. The pressing and return speeds can also be varied.

Two-column 300-ton Oilgear Press Designed for High-speed Operation

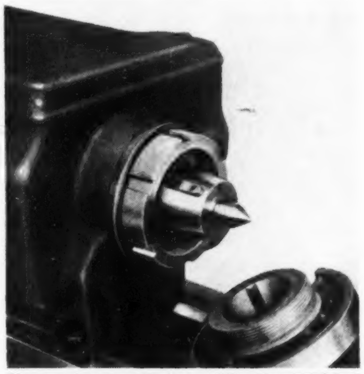


Leeds & Northrup Temperature Recording Controller

Micromax Temperature Recording Controller

An indicating recorder which can be used as an indicating, signaling, and recording controller, not only for temperature, but also for CO_2 and such factors as smoke density, chemical strength, etc., has been added to the line of industrial recording machines made by the Leeds & Northrup Co., 4921 Stenton Ave., Philadelphia, Pa. This new development, known as the "Silver Anniversary" Micromax recorder, has an easily read scale and a pointer which show the condition at any moment. A clear record for several hours is also shown on a strip chart. On the controllers, a second pointer shows the control setting. Multi-point records may be kept in different colors.

The operation of the control and signal contacts is undisturbed by air currents when the door is opened or when the chart is changed or the recording pen refilled. The pen holds seven weeks' ink supply. All parts are easily accessible, and the chart can be replaced without affecting other parts of the recorder.



LeBlond Tapered Spindle Nose with Key and Threaded Collar

Tapered and Keyed Spindle Nose for LeBlond Lathes

A tapered spindle nose provided with a key and a threaded collar, as shown in the illustration, has been developed by the R. K. LeBlond Machine Tool Co., Cincinnati, Ohio, for use on LeBlond lathes of all sizes. This spindle nose has been especially designed to promote safety of the operator, greater speed and accuracy in mounting the chuck on the spindle, and long life for the spindle and chuck fits. Only three sizes of chucks and faceplates are required with this new taper nose for lathes of all sizes from 12 to 36 inches. The chucks are interchangeable on all machines equipped with the tapered and keyed spindle nose.

The long hardened taper bearing accurately aligns the chucks and plates, and the key holds them securely in place, thus eliminating the backing-off hazard. The key in the spindle permits the plates or chucks to be hung on the spindle nose, so that the operator can use both hands to start and tighten the threaded collar. To take off or put on a faceplate or chuck requires only twelve to fifteen seconds. The key serves to bring the thread in the collar immediately into alignment with the thread on the faceplate or chuck being mounted on the tapered nose of the spindle, so that there is no delay in tightening the collar.

Ingersoll Ray-Blade Face Milling Cutters

Recognizing the essential difference in the maintenance requirements of roughing and finishing face milling cutters used for high-production operations, the Ingersoll Milling Machine Co., Rockford, Ill., has developed the Ray-Blade cutters shown in the illustration. In roughing cuts, the wear on the blade is mostly in a radial direction, which results in decreasing the diameter of the cutter. In finishing cuts, the wear is mostly on the face of the cutter. Thus the roughing cutter, shown to the left, is designed to permit adjusting the blades in a radial direction, whereas the finishing cutter, shown to the right, is arranged for axial adjustment of the blades.

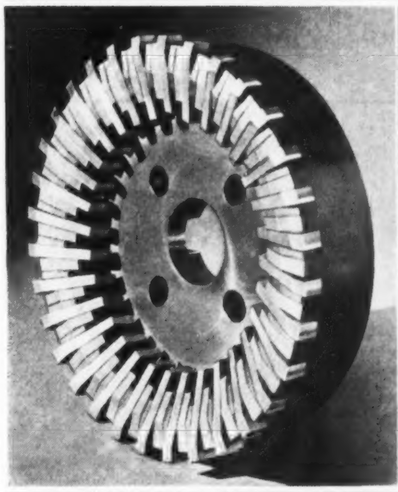
The double-tapered blades of these cutters are positively locked in the cutter housing with a compensating serrated wedge. The cutter blade is tapered lengthwise, so that it will resist a downward or backward pressure resulting from the cutting thrust. It is further dovetail-tapered across its width to prevent it from pulling out of its locating slot. A double-tapered serrated wedge is used to hold the blade in place. The cutter blade can be moved outward to permit regrinding, the wedge compensating for this movement.

The blades of these cutters are furnished in either high-speed steel or Stellite. The standard Ray-Blade is designed for light or medium cuts 1/4 inch deep or less. The radially adjusted blade gives twice as much wear as the blades of corresponding cone type cutters. The finishing cutters have closely spaced blades, which are set on the conical end of the cutter housing.

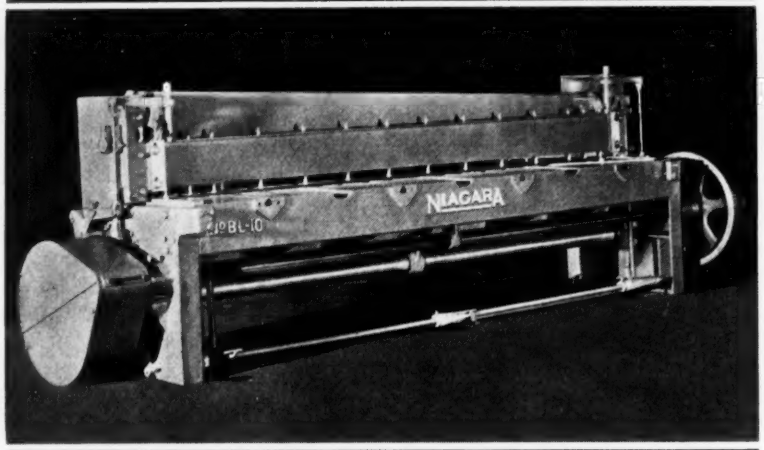
Photo-Cell Control for Industrial Applications

A photo-electric unit adapted for a wide range of industrial control purposes has been brought out by the Weston Electrical Instrument Corporation, Newark, N. J. This unit is so designed that the interruption of a beam of light provides the initial impulse for opening and closing an electric circuit to actuate counting, sorting, and weighing devices, automatic processing, controls, safety cut-offs, alarm warnings, etc.

The output capacity of the relay is 500 watts, which permits most installations to be operated directly by relay contacts without the use of external contactors. The relay is arranged for single-pole, double-throw operation and furnishes positive action of the relay at speeds up to 400 operations per minute.



Ingersoll Ray-Blade Roughing and Finishing Milling Cutters



Niagara Power Squaring Shears with Under Drive

Niagara Power Squaring Shears

A new line of Series "BL" power squaring shears built in 8-, 10-, and 12-foot lengths, with capacities for cutting 10- to 12-gage material, has been brought out by the Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y. These shears are of the under drive type. The cross-head is operated by connecting-rods that run directly from the eccentrics to the cross-head and thus relieve the housings from tension stresses.

The heavy webbed beds are keyed and bolted to the housings to assure positive alignment. The rear web of the bed covers the cross-shaft, thus protecting the operator when sheared pieces are being removed at the rear of the machine. The cutting line is clearly visible from the front of the shear between the pressure feet, as well as from a position above the cutting edge, as observed through an opening between the hold-down and the front web of the cross-head which slopes toward the rear. The low height of the hold-down bar enables the operator to observe the cut easily. The cross-head has a low slope which permits the flat cutting of narrow strips.

The hold-down is equipped with individual spring pressure feet which provide a firm grip on short as well as long sheets. The pressure feet are adjustable and do not depend on striking the bed as a means for limiting their travel when the shear is idling. A cam and toggle mechanism causes the hold-down to approach the work rapidly, and then slow down on making contact with the work, so that there is no severe jar or impact.

Themac Precision Grinder

The line of portable toolpost grinders made by The McGonegal Mfg. Co., 228 Orchard St., East Rutherford, N. J., is being extended by the addition of a Type J-1 precision grinder of aluminum construction which weighs only 9 1/2 pounds. This grinder is adapted for use on bench lathes, as well as small- and medium-sized engine lathes. It is similar to the J-2 and J-3 grinders of this company's manufacture in that the grinding spindle is adjustable about the motor armature through an arc of 240 degrees. This feature permits the grinding spindle to be brought down to the center of the smallest bench lathe or adjusted upward for larger lathes.

The drive is through an endless flat fabric belt. Three pulleys are supplied which give the grinding spindle speeds of 7000, 10,000, and 25,000 revolutions per minute for wheels from 3 inches to 1/4 inch in diameter with a motor speed of 12,000 revolutions per minute. This is the full load speed of the 1/3-horsepower universal motor. The grinding spindle is mounted on self-adjusting precision ball bearings. A pencil wheel chuck, such as shown in Fig. 2, is supplied for internal grinding up to a depth of 2 7/8 inches.

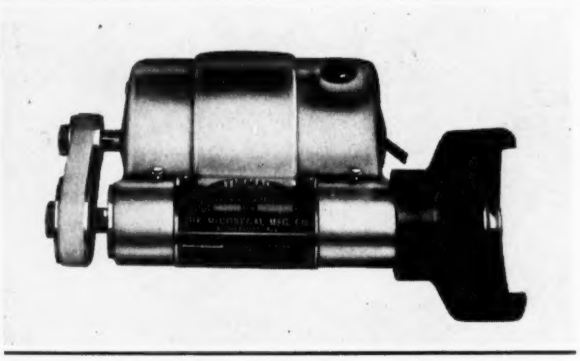


Fig. 1. Themac Precision Grinder Designed for Use on Lathes

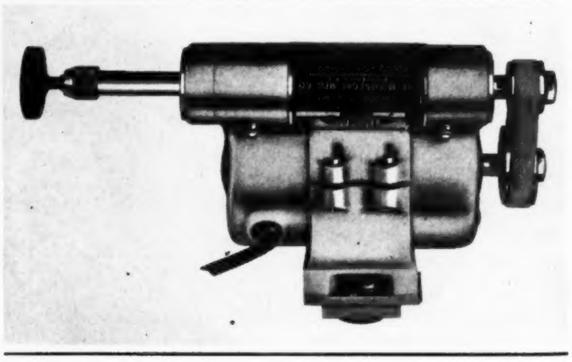
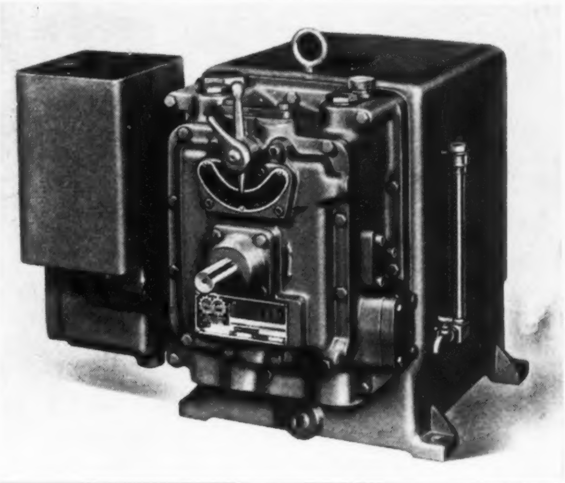
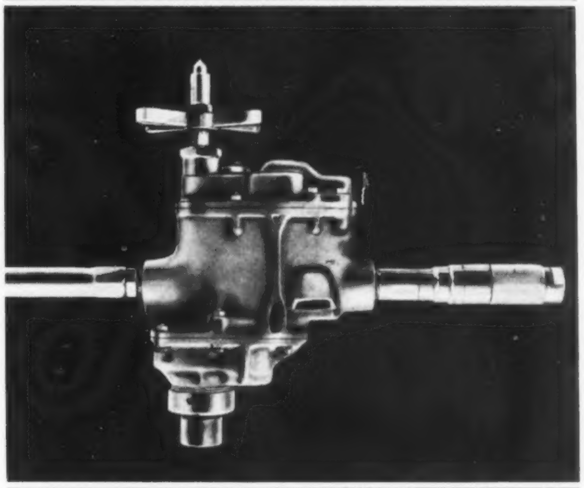


Fig. 2. Themac Grinder with Spindle Adjusted Upward to Suit Work



Oilgear Remote Controller for Fluid Power Feeds



Pneumatic Drill Brought out by Rotor Air Tool Co.

Remote Controller for Oilgear Feeds

A remote controller operated by a push-button station or limit switches has been brought out by the Oilgear Co., 1310 W. Bruce St., Milwaukee, Wis., for the fluid power feeds of this company's manufacture. This new controller is particularly adapted for machine tools. It is easily applied to new or rebuilt machines, and is designed to simplify installation, as it eliminates the more or less complicated mechanical devices previously used for obtaining manual, semi-automatic, or full-automatic control of fluid power feeds.

Any required cycle can be obtained as, for example, a semi-automatic cycle consisting of rapid traverse forward, feed forward, rapid traverse in reverse, and neutral. For full-automatic operation, a limit switch can be made to shift the pump controller to rapid traverse forward. A semi-automatic cycle can also be obtained, which gives rapid traverse forward, coarse feed forward, fine feed forward, delayed reverse, rapid traverse in reverse, and neutral.

In operation, a positive movement of the control-valve plunger is provided by dual solenoid-operated pilot valves and a four-station control cylinder, compactly built into one unit and fastened to the pump manifold. Four styles of controller units are available, each having pilot valves that provide four feed functions when the solenoids are energized and de-energized. Similar remote controls having triple solenoid-operated pilot valves to provide five feed functions are also available.

Rotor Pneumatic Drill

A heavy-duty pneumatic drill of the rotary type weighing only 22 pounds has been brought out by the Rotor Air Tool Co., 5704 Carnegie Ave., Cleveland, Ohio. This drill is made in two models, one—the E-72—having a speed of 450 revolutions per minute and a rated capacity for drilling holes up to 29/32 inch and for reaming up to 13/16 inch; and the other—the E-73—having a speed of 300 revolutions per minute and capacity for drilling holes up to 1 1/4 inches in diameter and reaming holes 1 inch in diameter. The drills have No. 2 and No. 3 Morse taper sockets.

Electric Marking Tool Made by Ideal Commutator Dresser Co.

These drills have been designed to stand up under hard service and to provide accessibility to all parts. A multi-port automatic governor controls the free speed, reducing air consumption and lessening drill and reamer burning or breakage. The feed-screw has a travel of 4 inches, and is so built that it cannot be backed out of the sleeve or screwed down to put unnecessary strain on the gear-case. A specially treated cast-iron cylinder liner is employed, and the cylinder housing and gear-case are made of a heat-treated aluminum alloy. A malleable iron gear-case can be supplied if desired.

Electric Tool for Marking Metals and Non-Metallic Materials

A portable electric tool for marking on practically any material, whether a metal or a non-conductor, has been brought out by the Ideal Commutator Dresser

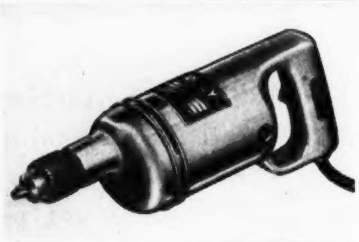
Co., 1011 Park Ave., Sycamore, Ill. This tool is designed to mark legible, permanent records and names quickly, easily, and safely on all metals and their alloys.

Dies, tools, plates, sheets, shapes, rods, forgings, castings, and pipes, as well as glass, pottery, ceramics, hard rubber, Bakelite, plastics, fiber, and similar materials, can be easily marked with this tool. It can be used to write the owner's name on tools or equipment and to write the manufacturer's name, price, or stock number on nameplates, glassware, test tubes, and various other products.

The tool is of convenient size for hand use, being 6 3/4 inches long over all and weighing only 2 pounds. It can be handled the same as a pencil or crayon. The point leaves permanent lines that are cut right into the surface. so that they cannot be removed by ordinary wear. The marker operates on 110-volt, 60-cycle alternating current.

Stanley Light-Weight Portable Electric Drill

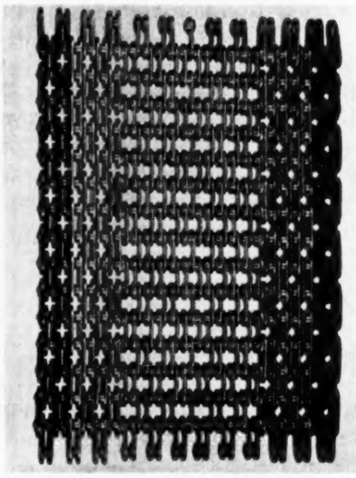
A light-weight electric drill known as the "Victor" No. 114, which is 12 inches in length and weighs only 5 1/4 pounds, has been added to the line of tools made by the Stanley Rule & Level Plant, New Britain, Conn. It will drill holes up to 1/4 inch in steel, and is equipped with a heavy-duty three-jaw chuck. The motor is of the universal type, operating on either direct or alternating current at a load speed of 1400 revolutions per minute. The motor housing and handle are cast in one piece from an aluminum alloy. A rocker motion switch is located in the handle.



Stanley Portable Electric Drill with Aluminum Alloy Housing

Whitney Open-Mesh Conveyor Chains

Conveyor chains that offer a maximum area of smooth flat conveying surfaces consistent with the need for an open mesh which will allow a cooling blast of air through the chain links have been developed by the Whitney Chain & Mfg. Co., Hartford, Conn. These chains were originally designed for service in the glass manufacturing industry for conveying the product from the molding machine to the annealing oven, but they can also be used in many cases where a flat metallic conveying belt is required.



Section of Whitney Open-mesh Conveyor or Chain

The chains are made up from standard units and can be had in any desired width. They can be made entirely of steel, steel with bronze center links, or stainless steel, according to the needs of the particular application. The chains are driven by a wide-faced silent chain sprocket which engages the silent chain link units in the center sections of the chains.

Improved No. 12 Brown & Sharpe Micrometer Caliper

Brown & Sharpe Micrometer Calipers

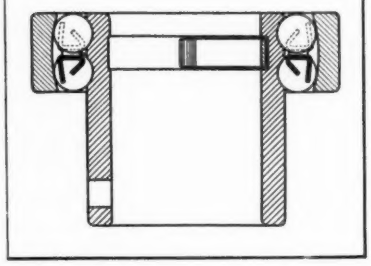
Micrometer calipers Nos. 12 and 13, made by the Brown & Sharpe Mfg. Co., Providence, R. I., have been redesigned with a C type frame. The narrow anvil end of the frame permits measuring deep in slots, while the C type frame provides a convenient grip and full measuring capacity.

These calipers have a range of 0 to 1 inch, the No. 12 measuring in thousandths of an inch, while the No. 13 measures in ten-thousandths of an inch.

SKF Grip-Lock Ball Bearing

The grip-lock bearing shown in the illustration is the latest addition to the line of anti-friction bearings made by the S K F Industries, Inc., Front St. and Erie Ave., Philadelphia, Pa. This bearing is designed to facilitate quick application to a shaft without the use of tools of any kind and to insure positive locking of the inner race on the shaft.

This development consists essentially of a conventional S K F



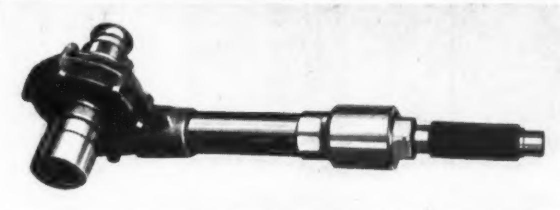
S K F Grip-Lock Bearing which can be Installed without Using Tools

self-aligning bearing with an extended inner race that has an eccentric groove machined in the bore. Fitted in this groove is a piece of spring steel known as the grip-lock shoe. When the shoe is in the deepest part of the eccentric groove, the bearing can be readily slipped on the shaft. When the inner race of the bearing is held while the shaft turns in the driving direction, the knurled surfaces at the ends of the grip-lock shoe grip the shaft, causing the shoe to wedge in the shallow part of the eccentric groove, which results in locking the bearing securely on the shaft.

Thor "Hamerench" for Nuts and Staybolts

A pneumatic tool combining the actions of a hammer and a wrench has been brought out by the Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago, Ill. This tool, known as the Thor No. 603 "Hamerench," applies and removes all types of nuts used in locomotive work, structural steel work, automobile plants, etc. Being of the right-angle type, it can be operated in places that are inaccessible to straight type tools.

The tool is so designed that 1800 perfectly timed impacts are delivered to the nut per minute. The speed and power of the blows are controlled through a self-closing throttle. A pawl in the ratchet mechanism prevents any backing up of the ratchet collar. The ratchet collar receives its motion from a piston in the hardened steel barrel, which, in turn, actuates the spindle that drives the socket. All torsion developed by each impact is absorbed in the tool, thus providing safety for the operator.



Thor "Hamerench" Brought out by the Independent Pneumatic Tool Co.

The tool will remove and apply all sizes of nuts up to 1 1/8-inch bolt size. The socket requires a working space of 8 inches. The over-all length of the tool is 22 1/2 inches, and the weight is 25 pounds.

Williams Reversible Ratchet Wrench Designed for Heavy Duty

Williams "Superector" Reversible Ratchet Wrenches

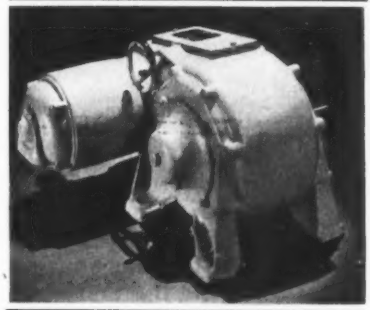
A line of heavy-duty reversible ratchet wrenches known as the "Superector" which embody several new structural and design features has been brought out by J. H. Williams & Co., 75 Spring St., New York City. A particular feature of the new wrenches is the use of quadruple pawls which provide greater strength and durability. These wrenches have drop-forged handles and are made in five sizes from 24 to 48 inches. Both hexagonal and square sockets, with the hole extending clear through the wrench, are made with openings ranging from 1 1/16 to 4 5/8 inches.

These wrenches are designed for rapid operation under severe service in bridge and other structural work, as well as in machine assembling.

Sterling Speed-Trol Motors

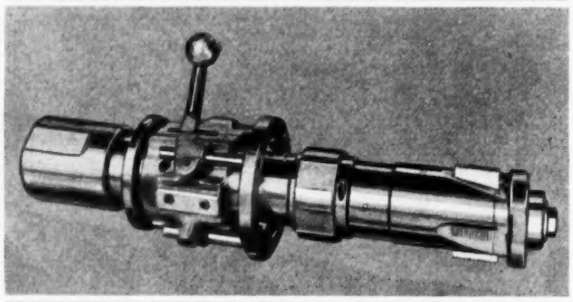
Infinite speed variation covering a range of ratios from 2 to 1 up to 6 to 1 is obtainable in the Speed-Trol units brought out by Sterling Electric Motors, Inc., Telegraph Road and Atlantic Blvd., Los Angeles, Calif. These units are made in sizes from 1/4 to 15 horsepower and supersede the former Sterling vari-speed motors. The universal mounting permits assembling the motor on either side of the gear reduction housing, above the housing or at different angular positions. The handwheel controls can be assembled in any of four operating positions.

The variable-speed mechanism consists of a V-belt which runs on two pulleys that are mounted on fixed parallel shafts. Turning the speed controlling handwheel changes the effective diameters of both pulleys simultaneously.

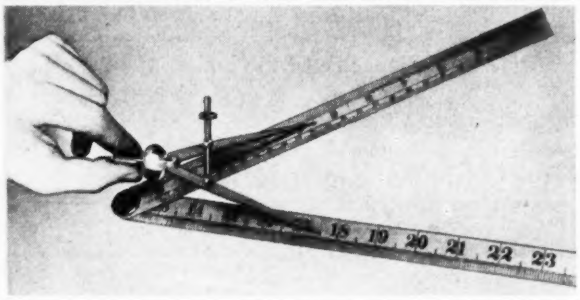


Speed-Trol Motor which gives any Speed from 300 to 1200 R.P.M.

The motors can be assembled with either single or multiple reduction, standard "Slo-speed" gears, making available any speed desired. The supporting feet can be left off when the unit is to be built into a machine. The speed reduction units are available with or without a motor.



Landis Collapsible Tap Equipped with Pilots to Insure Concentric Thread



Combination Rule and Protractor Placed on the Market by the George Scherr Co.

Landis Piloted Collapsible Taps

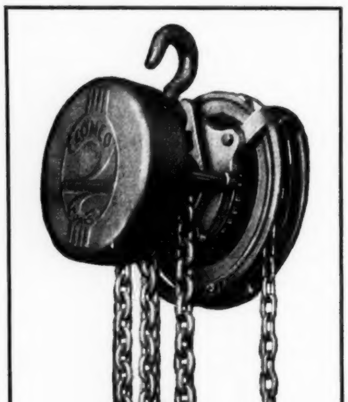
A collapsible tap provided with pilots to insure tapping the thread concentric with previously machined surfaces has been placed on the market by the Landis Machine Co., Waynesboro, Pa. The illustration shows how the pilots are applied to a Style LT collapsible tap. The body of the tap is made of sufficient length to reach the bottom of a tapped hole in a steel casting used for a tractor part.

The pilot ahead of the chasers lines up the tap with the bore of the hole to be tapped. The rear pilot is made in the form of a collar which fits over the tap body. This pilot fits a reamed hole near the top of the casting with which it is necessary to maintain concentricity. Both pilots are made of steel, are hardened and ground, and are made to revolve with the work in order to prevent seizing. Collapsible taps of the type illustrated, in all sizes from 1 3/8 to 12 inches, can be furnished with similar pilot arrangements for a large variety of work.

Conco Ball-Bearing Hand-Chain Hoists

A spur-geared hand-chain hoist equipped with precision ball bearings has been placed on the market by the Conco Engineering Works, 828 Jefferson St., Mendota, Ill. From 1/4- to 6-ton hoists of this type are used for material-handling in most industries, but hoists of similar design are made by this company for handling loads up to 20 tons.

To lift its rated load through a distance of 1 foot, the 1 1/2-ton hoist requires a chain overhaul of 35 feet and a chain pull of 100 pounds; the 3-ton hoist requires a 70-foot chain overhaul and a pull of 101 pounds; while the 6-ton hoist requires a chain overhaul of 133.5 feet and a pull of 117 pounds.



Conco Hand-chain Hoist with Precision Ball Bearings

Combination Steel Rule and Protractor

A combination jointed stainless-steel rule and protractor for engineers, draftsmen, shop men, and others who do accurate lay-out work has been placed on the market by the George Scherr Co., 130 Lafayette St., New York City. To set the blades of the scale to the desired angle, a pair of dividers is first set to the corresponding chord on a scale engraved on one of the blades. The blades of the rule are then opened until the divider points span the distance between two center dots engraved on the rule, one on each blade. The illustration shows the method of using the dividers to make this simple setting. For measuring angles, the operation is reversed.

The chords cover all angles from 0 to 120 degrees, increasing by increments of one-half degree. The joint of the rule is provided with a spring tension which supplies sufficient friction to hold the angular setting of the rule blades for scribing and lay-out work. The rule has 1/8-, 1/16-, 1/32-, and 1/64-inch graduations.

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The name "X-ray" was adopted by Professor Rontgen, the discoverer of these electric rays, because he was not sure of their exact characteristics, and therefore used for them the symbol of the unknown quantity in mathematics, as an indication of their mysterious qualities.